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VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1933.** [Report on the Work of the Phytopathological Service in 1933.]—*Versl. PlZiekt. Dienst Wageningen* no. 76, 118 pp., 3 pls. Wageningen, August 1934.

Pests observed in Holland in 1933, in addition to some noticed in recent reports [*R.A.E.*, A **21** 533; **22** 270, 339; etc.], included *Orthotylus flavosparsus*, Sahlb., a Capsid common on chenopodiaceous weeds, which was numerous on young beet in a recently reclaimed area, but did not cause apparent injury to it; the mite, *Fuscuropoda marginata*, C. L. Koch (*Uropoda obnoxia*, Reut.), which attacked the root-collar of melons and against which a nicotine-soap spray proved effective; and *Tortrix loeflingiana*, L., which caused widespread injury to oak leaves near Wageningen.

Chermes (*Gilletteëlla*) *cooleyi*, Gill., was widely distributed and infested Douglas fir [*Pseudotsuga taxifolia*] very severely. H. J. de Fluiter found that the winged Aphids that developed on Douglas fir from eggs laid by hibernated females flew to *Picea sitchensis* or *P. glauca* (*alba*) and oviposited, adults of both sexes from these eggs being then found attached to the needles [*cf.* **22** 529; etc.]. The infestation was more marked on trees near the southern edge of a wood. A nicotine dust and a spray of 0·1 per cent. nicotine in 2 per cent. soap solution both gave excellent results.

Electricity was tested against larvae of *Sciara* attacking spores of ferns sown in shallow pans. Direct current of 220 and 380 volts having given good results, a large-scale test was made with a 50-cycle alternating current of 500 volts, zinc electrodes being inserted about 19 ins. apart in the soil. The larvae were killed but not the eggs; the number of applications required to prevent subsequent infestation is being investigated. The fern spores near the electrodes were killed.

On apple, a 0·1 per cent. solution of nicotine gave the best results against *Hoplocampa testudinea*, Klug, and its effectiveness against *Cydia* (*Carpocapsa*) [*pomonella*, L.] was not increased by the addition of 0·5 per cent. lead arsenate. Lead arsenate was effective against the plum sawfly, *H. fulvicornis*, Panz. (*minuta*, Christ), but at strengths of 1–1½ per cent. it caused loss of foliage.

A list of all the insecticides and fungicides tested during the year is given, with notes on the results obtained.

GUILLAUME (A.). **Le pétunia et le doryphora de la pomme de terre.**—*Rev. Bot. appl.* **14** no. 156 pp. 659–663, 5 refs. Paris, 1934.

The author summarises a note by J. Feytaud, who in laboratory experiments in France during the autumn of 1933 found that the adults of *Leptinotarsa decemlineata*, Say, definitely preferred the leaves of potato to those of *Petunia*, while some of the larvae fed on *Petunia* and died [*cf. R.A.E.*, A **20** 240; **21** 495]. It was not certain, however, whether they died of poisoning or of starvation. In experiments conducted in the field during July and August 1932 by B. Trouvelot and others, adults showed an aversion from *Petunia*, but the larvae could easily be induced to feed on it, although they did not concentrate naturally on it as they did on *Salpiglossis*. On either plant, the larvae died. It was planned to make further studies during 1934, although

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it is not thought likely that *Petunia* will be found to provide an effective trap-plant [*cf.* **22** 434]. Experiments to determine if there was nicotine in *Petunia* that might account for the supposed poisoning of the larvae gave negative results.

CHEVALIER (A.). **Les maladies et les ennemis de l'arachide.**—*Rev. Bot. appl.* **14** no. 157 pp. 709–755, 4 pls., 4 figs. Paris, 1934.

The part of this study (pp. 733–755) dealing with the insect pests of ground-nuts [*Arachis hypogaea*] is based on Roubaud's monograph on those occurring in Senegal [*R.A.E.*, A **5** 338]. This work, which the author considers still authoritative, is supplemented by references to the discoveries of others in various parts of the world and by the results of his own investigations in Senegal during 1929. The latter generally confirm and supplement Roubaud's work, but add little information of economic importance.

SMEE (C.). **Report of the Entomologist.**—*Rep. Dep. Agric. Nyasaland 1933* pp. 46–53. Zomba, 1934.

An account is given of the movement in Nyasaland in 1932–34 of locust swarms, from which the northern part of the Protectorate was remarkably free. Hoppers of *Locusta migratoria migratorioides*, R. & F., developed from eggs laid in November 1932 [*cf. R.A.E.*, A **22** 119], and gave rise to flying swarms in January 1933, some of which migrated to Portuguese East Africa. Newly developed adults were caught on an island in Lake Chilwa in April, a few of which showed characters indicating the beginning of a possible development towards ph. *solitaria*. Flying swarms of *Nomadacris septemfasciata*, Serv., invaded the Protectorate from the west and from Northern Rhodesia early in January, and swarms of local origin developed in March and April. Oviposition appeared to occur from the end of October to January 1934. Hopper swarms developed during this period, and flying swarms were reported in early February 1934. The later developing swarms were severely affected by disease and parasites early in 1934, so that the number of hoppers reaching maturity was small and the flying swarms appeared later (about March 1934) than normal. Annotated lists of the food-plants of hoppers and adults are given. In two districts, 20 per cent. of the cotton plants were attacked by flying swarms and half of these totally destroyed. The older plants, however, produced new growth, so that the crop loss did not exceed 7 per cent. During the dry season, the flying swarms largely confined themselves to the foliage of jungle trees, although fruit trees were attacked on several occasions and leguminous crops in North Nyasa suffered considerably later in the year. Feeding takes place mostly after the swarm has settled for the night. Many trees were completely defoliated, the leaf-stalks being bitten through, and large branches were often broken off by the weight of the locusts. The fungus, *Empusa grylli*, was first noticed in a small swarm of second-instar hoppers on 12th February 1934, and was afterwards found practically throughout the Protectorate. All hopper instars except the first were attacked.

Tobacco plants were injured by *Cydnus* sp., *Dereodus recticollis*, Mshl., and the Aleurodid [*Bemisia* sp.], which was associated with leaf-curl [*cf.* **22** 120]. A single larva of *Anthores leuconotus*, Pasc., was found in a tea plant, this Lamiid having previously been recorded only

from coffee. *Zonocerus elegans*, Thnb., was exceptionally injurious to *Citrus* in the early part of the year in one district.

Larvae found on cotton in Angola and sent for identification proved to be *Mometa zemiodes*, Durrant.

NONELL COMAS (J.). **Investigacions biològiques sobre el corc del suro *Coroebus undatus* (Fabr.).** [Biological Investigations on the Cork Borer.]—*Mem. R. Acad. Barcelona* (3) **23** no. 23 pp. 481–498. Barcelona, June 1934.

In Catalonia, cork oaks [*Quercus ilex* var. *suber*] are infested by the Buprestid, *Coraebus undatus*, F., the larvae of which mine in the cork layer [*cf. R.A.E.*, A **15** 378]. Brief descriptions are given of the adult, larva and pupa. The beetles occur in May–July. The eggs, which are usually laid on the lower part of the trunk, hatch in 10–20 days. The larvae pupate in April or May in ovoid cells near the surface of the bark. The larval galleries cause a hypertrophy that affects the quality of the cork, so that in trees that have been infested for several years it is very poor. The protection of birds is said to have caused the complete disappearance of *C. undatus* from one district, and the breeding of its insect enemies, chiefly the Sphegid, *Cerceris buprestícida*, Duf., might also be of value. The cork bark should be removed in the spring and if possible also at the end of summer, as many larvae will then be killed by exposure. Trees over as large an area as possible should be barked at the same time, and those that have been long infested should be converted into charcoal.

RIPPER (W.). *Agrotis obelisca* **S.V., ein neuer Rübenschädling.** [*Euxoa obelisca*, a new Pest of Beet.]—*Neuheiten PflSch.* **27** no. 4 p. 86. Vienna, September 1934.

Serious injury to the roots and leaves of sugar-beet over about 600 acres in the Burgenland district, Austria, was caused in June 1934 by *Euxoa* (*Agrotis*) *obelisca*, Schiff. The larvae began to pupate early in July, and adults emerged from 31st July to 20th August.

SCHNEIDER (H.). **Untersuchungen über die an der Zuckerrübe saugenden Insekten und deren Schadwirkung unter Berücksichtigung der Rübenblattwanze (*Piesma quadrata* Fieb.).** [Investigations on the Sucking-insects of Sugar Beet and the Injury done by them, with Consideration of the Beet Leaf Bug, *P. quadrata*.]—*Dissert. Landw. Hochsch. Berl.*, 1933, 73 pp. (Abstr. in *Neuheiten PflSch.* **27** no. 4 pp. 95–96. Vienna, September 1934.)

Thrips tabaci, Lind., attacks only the lower epidermis of the leaves of sugar-beet; *Piesma quadrata*, Fieb., *Calocoris norvegicus*, Gmel., *Palomena prasina*, L., *Dolycoris baccarum*, L., *Pyrrhocoris apterus*, L., and *Empoasca* (*Chlorita*) *flavescens*, F., injure the palisade and parenchyma tissues and vascular bundles; and *Myzus* (*Phorodon*) *persicae*, Sulz., *Aphis* (*Doralis*) *fabae*, Scop., and *Lecanium corni*, Bch., feed on the parenchyma and phloem.

QUILIS PÉREZ (M.). **Algunos Aphidiidae de Checoslovaquia (Hym. Brac.).**—*Eos* **10** no. 1–2 pp. 5–19, 17 figs. Madrid, 5th August 1934.

Notes are given on the morphology and hosts of 14 species of APHIDIINAE observed in Czechoslovakia, including the following new

species : *Aphidius baudysi* from *Aphis galii*, Kalt. ; *Trioxys amoplanus* from *Macrosiphum sonchi*, L. ; and *Ephedrus nacheri* and *Diaeretus croaticus* from *Aphis* spp.

Plantesygdomme i Danmark 1933. [Plant Diseases and Pests in Denmark in 1933.]—*Tidsskr. Planteavl* **40** pp. 258–305, 3 figs., 2 graphs ; also as *Overs. St. Plantepat. Forsøg* no. 50. Copenhagen, 1934. (With a Summary in English.)

Pests occurring in Denmark in 1933, in addition to some previously noticed [*R.A.E.*, A **20** 144, 655 ; **22** 86], included : *Phyllopertha horticola*, L., which caused much damage to fruit trees and bushes ; *Cephus pygmaeus*, L., which was more common than usual, broken wheat straws amounting in some cases to 10 per cent. of the crop ; *Eriosoma lanigerum*, Hsm., which owing to favourable climatic conditions has increased during recent years on apple near Copenhagen and Odense ; *Apion aestivum*, Germ., on clover ; *Bryobia* sp., which was found on apple leaves together with *Paratetranychus pilosus*, C. & F., and was also common on ivy, from which, in one case, it migrated in numbers into a dwelling house ; the Jassid, *Eupteryx stellulata*, Burm., which has only once previously been collected in Denmark and was found in large numbers feeding on cherry foliage ; and *Monarthropalpus buxi*, Lab., which was found on the foliage of box (*Buxus*) in a garden near Frederiksberg, this being its first recorded occurrence in Denmark.

Lundblad (O.). **Hallonmalen,** *Incurvaria rubiella* (**Bjerk.**) **som skadedjur i Sverige.** [*I. rubiella* as a Pest of Raspberry in Sweden.] —*Medd. Växtskyddsanst.* no. 4, 13 pp., 8 figs., 35 refs. Stockholm, 1934. (With Summary in German.)

Incurvaria rubiella, Bjerk., is widely distributed on raspberry throughout Sweden, but is rare and not generally of special importance, though of recent years it has become considerably more numerous in the neighbourhood of Stockholm. The adult, pupa and larva are described. The eggs are laid in the open blossoms immediately on the stamens. The young larvae live in the fruit until it matures, without injuring either blossom or fruit in any way. They then form cocoons, generally in the soil but sometimes on the stem. In the following spring they bore into the buds and eat out the contents. They pupate in June in the buds or leaves, and the adults emerge soon afterwards. Only one generation is known to occur annually in Sweden. The chief control measures recommended are painting the stems with banding adhesive and spraying with 10 per cent. tar distillate [*cf. R.A.E.*, A **5** 277 ; etc.].

Lindblom (A.). **Plommongallkvalstret** (*Eriophyes similis* **Nal.**) **och dess bekämpande.** [*E. similis* and its Control.]—*Medd. Växtskyddsanst.* no. 6, 18 pp., 3 figs., 42 refs. Stockholm, 1934. (With Summary in German.)

Records of the occurrence of *Eriophyes similis*, Nal., on plum in Sweden during 1911–32 show that its range extends over the southern portion of the country as far north as the Dal river and corresponds approximately to that of the cultivated plum. Its distribution in

other countries is discussed [*cf. R.A.E.*, A **18** 493, 693]. The full-grown mites mine the leaves remaining on the tree in autumn and then migrate to the twigs and branches, in which they hide in crevices or under pieces of bark. In spring, they suck the sap of the tender leaves, thus inducing the formation of galls, which are observed at the end of May or beginning of June. In these they live throughout the summer and increase to large colonies. The method of gall formation is described. Where infestation is severe, the fruit is also attacked, a number of lip-shaped excrescences being formed and the skin much thickened and scored. On the leaves, most of the galls occur along the edges, as many as 54 having been recorded on a leaf 65 mm. long by 35 broad.

Trees of a local variety of plum that appears to be particularly susceptible were sprayed on 26th April 1932, when they still showed no sign of foliage, with various materials, and examined on 29th August. Good results were obtained with a proprietary combination of tar distillate and mineral oil at 2½ per cent. strength. Two lime-sulphur preparations, although almost as effective, cost twice as much. A mineral oil emulsion alone, at concentrations up to 2½ per cent., proved ineffective.

AHLBERG (O.). **Skadedjur i Sverige åren 1928–1932.** [Pests in Sweden during 1928–32.]—*Medd. Växtskyddsanst.* no. 7, 49 pp., 18 figs., 13 refs. Stockholm, 1934.

This general review of the more important agricultural pests observed in Sweden during the years 1928–32 includes records of about 160 species of insects arranged under their Orders, as well as of Myriapods and mites. Brief notes are given on the measures employed in the control of some of them.

AHLBERG (O.) & PALMGÅRD (A.). **Undersökning över cyanvätets användbarhet som bekämpningsmedel mot skadedjur i växthus.** [Investigation on the Practicability of Hydrocyanic Acid as a Means of controlling Insect Pests in Greenhouses.]—*Medd. Växtskyddsanst.* no. 8, 18 pp. Stockholm, 1934.

Tests to determine the effectiveness for greenhouse fumigation of hydrocyanic acid gas generated from Cyanogas dust (which contains 40 per cent. calcium cyanide) were carried out in Stockholm during 1931–33. The rates at which this fumigant can be applied at temperatures of 12–22°C. [53·6–71·6°F.] and humidities of 50–75 per cent. without injury are shown in relation to over 200 greenhouse plants. In tests with insects satisfactory control of Thysanoptera and Aphids was secured with 6-hour exposures to weak concentrations (3–3½ oz. Cyanogas to 10,000 cu. ft.); but 3–4 treatments with high concentrations and long exposures were necessary to kill fully-developed mealybugs (*Pseudococcus* sp.).

Fumigation with 6 oz. to 1,000 cu. ft. for 17 hours in an air-tight chamber killed only 2–3 per cent. of *Tetranychus telarius*, L. (*althaeae*, v. Hanst.), the highest dosages supported by the hardiest greenhouse plants being 1½–2 oz. to 1,000 cu. ft. Larvae of *Gracilaria azaleella*, Brants, on *Azalea* were not affected by fumigation for 10 hours at 7 oz. to 10,000 cu. ft., and similar negative results were obtained against *Phytomyza atricornis*, Mg., on chrysanthemum, 5 oz. being the rate considered safe for chrysanthemum and *Azalea*. The cost

of various proprietary preparations embodying hydrocyanic acid is discussed and compared with that of other materials used in the control of greenhouse pests.

LINDBLOM (A.). **Bekämpning av myror.** [Control of Ants.]—*Flygbl. Växtskyddsanst.* no. 8, 5 pp., 1 fig. Stockholm, 1934.
TULLGREN (A.). **Blodlusen** (*Eriosoma* [*Schizoneura*] *lanigerum* **Hausmann).**—*Op. cit.* no. 9, 4 pp., 4 figs.

The first of these leaflets briefly outlines various measures employed in the control of ants, of which *Formica rufa*, L., *Lasius niger*, L., *L. flavus*, F., and *Camponotus herculeanus*, L., are the chief species of economic importance in Sweden. Derris and pyrethrum dusts are particularly recommended as being harmless to man, animals and plants.

The second leaflet gives an account of the life-history and control of *Eriosoma lanigerum*, Hsm., which has now been established on apple in Sweden for nearly 30 years. Dormant sprays of 10 per cent. tar distillate and summer sprays of 2 per cent. nicotine, 4 per cent. soft soap, 4 per cent. denatured alcohol and 90 per cent. rain water have proved effective.

ZUMPT (F.). **Der Tamarindenfruchtrüssler, ein neuer deutscher Vorratsschädling.** [The Tamarind Fruit Weevil, a new German Store Pest.]—*Mitt. Ges. Vorratsschutz* **10** no. 5 p. 50. Berlin, September 1934.

The author has found examples of *Calandra linearis*, Hbst., among specimens of weevils collected in Hamburg in and before 1906, including some stated to have been found in tamarind bark in a warehouse.

VAPPULA (N. A.). **Die** *Eristalis*-**Larven als Schädlinge im Flachsrösteteich.** [*Eristalis* Larvae as Pests in a Flax Steeping Pool.] —*Mitt. Ges. Vorratsschutz* **10** no. 5 pp. 53–54. Berlin, September 1934.

In Finland in 1925, larvae of a Syrphid, *Eristalis* sp., injured the fibres of flax stems in the steeping pool of a linen factory. At points on the surface of the stems where they had collected, the bast was divided into fine fibres, and this apparently accelerated the decomposition of the surface tissue and woody parts. The larvae also injured the fibres mechanically by their movements.

ZACHER (F.). **Speckkäfer in Wespennestern.** [Lard Beetles in Wasps' Nests.]—*Mitt. Ges. Vorratsschutz* **10** no. 5 pp. 54–55, 1 ref. Berlin, September 1934.

Larvae of *Dermestes lardarius*, L., were found in the one remaining comb of a wasps' nest that had been destroyed in a hay-loft in Thuringia in August 1934. Such nests are therefore possible sources of infestation.

Borchert (A.). **Die Bekämpfung der Wachsmottenplage.** [The Control of the Wax Moths.]—*Dtsch. Imkerführer* no. 6–8. Sep. 50 pp., 6 figs., 16 refs. Berlin, 1934.

This pamphlet, which is issued for the use of bee-keepers in Germany, comprises an account of the bionomics and control of *Galleria mellonella*, L., and *Achroia grisella*, F.

Maercks (H.). **Untersuchungen zur Oekologie des Kohlweisslings (*Pieris brassicae* L.). i. Die Temperaturreaktion und das Feuchtigkeitsoptimum.** [Investigations on the Ecology of the Cabbage White Butterfly. i. Temperature Reaction and Humidity Optimum.]—*Z. Morph. Oekol. Tiere* **28** no. 5 pp. 692–721, 11 figs., 16 refs. Berlin, 11th August 1934.

The following is taken from the author's summary of work done in Berlin: *Pieris brassicae*, L., is distinguished by a wide range of tolerated temperatures. At optimum humidity, 40 per cent. of the larvae developed into pupae at 8°C. [46·4°F.] and 32 per cent. into adults at 31°C. [87·8°F.]. The lowest limit of development was about 7°C. [44·6°F.] and the highest about 36°C. [96·8°F.]. At 14–26°C. [57·2–78·8°F.], there was no pre-imaginal mortality. The relation to temperature of the duration of each stage can be expressed by an asymmetrical catenary line. At low temperatures, all pupae hibernate; at high temperatures, all develop without winter rest; between about 16 and 21°C. [60·8–69·8°F.], some hibernate and some develop. By observations at 29°C. [85·2°F.] (at which temperature the development of all stages is most rapid), it was ascertained that the optimum relative humidity was 85 per cent. The optimum temperature (at which in the presence of other harmful factors mortality was lowest and at which variations due to different degrees of humidity were smallest) was 23°C. [73·4°F.].

Andersen (K. T.). **Experimentelle Untersuchungen über den Einfluss der Temperatur auf Eierzeugung von Insekten. i. Einfluss konstanter Temperaturen auf die Eierzeugung von *Sitona lineata* L.** [Experimental Investigations on the Influence of Temperature on Egg Production in Insects. i.]—*Biol. Zbl.* **54** no. 9–10 pp. 478–486, 2 figs., 4 refs. Leipzig, 1934.

In further experiments in Germany [*cf. R.A.E.*, A **21** 390], in which 15 pairs of *Sitona lineata*, L., were kept at each of 5 different constant temperatures between 16°C. [60·8°F.] and 25·5°C. [77·9°F.], the number of eggs produced by one female varied from 15 to 599 at the lower extreme and from 387 to 4,203 at the higher. The dependence of egg-production on temperature cannot be expressed by a temperature coefficient. The results of the experiments yielded an S-curve similar to others, such as that for metabolism. Graphs of the greatest and of the average egg-production of all the weevils together and of the daily amount can be best calculated as a symmetrical catenary line reciprocal. The zero point of the curve, representing the most favourable temperature for egg-production, is 24·5°C. [76·1°F.]; at this temperature an average of 1,800 eggs and a maximum of 4,500 were laid per female.

Wilson (G. F.). **Insect Pests of Garden Irises : their Detection and Control.**—*Iris Yearb. 1934* pp. 77–86, 3 figs., 15 refs. Tunbridge Wells, 1934.

Brief notes are given on the bionomics and control of a number of pests of garden irises in Britain, most of which are polyphagous and only attack irises occasionally. Among those dealt with are *Aphis newtoni*, Theo., which is found low down on the leaf-blades, *Anuraphis tulipae*, Boy., which infests the rhizomes or bulbs, *Hepialus lupulinus*, L., the larvae of which tunnel in the rhizomes of bearded irises, *Otiorrhynchus sulcatus*, F., which injures irises grown from seed and kept for long periods in pots, *Dizygomyza iraeos*, Gour., the larvae of which tunnel in the leaves, and *Rhadinoceraea micans*, Klug, the larvae of which feed on the edge of the leaves.

Goffe (E. R.). *Empis livida* **Linn. (Dipt., Empid.) as a Factor in the Control of** *Tortrix viridana* **Linn. (Lep., Tortr.).**—*J. Soc. Brit. Ent.* **1** pt. 2 pp. 45–46, 2 refs. Southampton, 3rd October 1934.

Males of *Empis livida*, L., were observed preying on adults of *Tortrix viridana*, L., near oak trees in Hampshire in June 1934. They are known to carry the moths intact in order to give them to the females when they pair. Pairing was seen on 22nd and 25th June, and in each case *T. viridana* was the prey.

Madwar (S.). **The Biology and Morphology of** *Pnyxia scabiei* **Hopkins (Diptera : Nematocera).**—*Bull. soc. ent. Egypte* **17** no. 4 pp. 136–149, 2 pls., 4 figs., 13 refs. Cairo, 1934.

A detailed account is given of the larval morphology and anatomy of *Pnyxia scabiei*, Hopk. This Mycetophilid was bred from the manure of potted cucumber plants collected near Cambridge, England. In captivity the females began to oviposit 2–3 days after emergence and laid 30–40 eggs in short strings just below the surface of the soil. At 14–20°C. [57·2–68°F.], the egg stage lasted 3–5 days, the four larval instars 2–3 days each, and the pupal stage 3–6 days. The females are wingless, but there are two kinds of males, the one with fully developed, the other with reduced wings. If the soil in a pot is dry, the newly hatched larvae move towards damper spots and attack the tender roots of the plant, but if the soil is submerged in water, most of them rise to the surface and die [*R.A.E.*, A **11** 136 ; but *cf.* **21** 414].

Carmin (J.) & Scheinkin (D.). **Red Scale in Palestine (Hemiptera : Coccidae).**—*Bull. Soc. ent. Egypte* **18** no. 1–2 pp. 242–274, 3 diagr., 1 pl., 67 refs. Cairo, 1934.

Data on *Aonidiella aurantii*, Mask., published in Palestine from 1921 to 1932 are reviewed, all stages of both sexes of this Coccid are described, and an account is given of observations on it since 1929 in the neighbourhood of Tel-Aviv. Previous observers have stated that it is viviparous, but the authors have often found eggs under the scales [*cf. R.A.E.*, A **22** 554]. Evidence obtained by measurement of adult females suggested that there are three types. One occurs throughout the year and is found alone during June and July ;

since no adult males or eggs were observed in June or July, this type is probably viviparous and parthenogenetic. The other two, which are probably sexual, occur during November–May, and one of them also in August–September. There appear to be several overlapping generations a year. Crawlers were found throughout the year, except in late April and May, and during a brief interval about the end of October. They became stationary after moving actively for 1–2 hours. On orange, their appearance coincided with the hardening of the new growth; lemon trees, which have more prolonged and continuous growing periods, were more severely attacked. Methods of manuring and cultivation that would lengthen the dormant periods in the trees' growth would probably check the development of *Aonidiella* by interrupting its supply of food. Although the adult male is highly phototropic, experiments showed that phototropism is not the primary factor governing the dispersion of the crawlers. The authors suggest that such a factor may be found in olfactory responses to certain substances in the leaves and fruit. Such substances would form first in the parts exposed to light and heat, and crawlers in fact infest all parts of ripe fruit that are exposed to light. Moreover, they were not found on immature fruit and young leaves, or on stems of old trees, whatever the degree of exposure to light, and they were rarely observed on the lower surfaces of the leaves.

Infestation of *Citrus* by *Aonidiella* in Palestine is sporadic, and there is evidence of natural biological control, with which the unrationalised use of insecticides and fungicides interferes. The most important insect parasite observed was *Aphytis chrysomphali*, Merc., the stages of which are described. This Aphelinid was only active during November–May [*cf.* **22** 554], when it caused about 50 per cent. parasitism. In January 1931, scales at a field station turned black and died, having become infested by two fungi that usually occurred together. The few larvae produced by infested scales failed to develop, and groves where the fungi were observed became practically free. Some predacious mites and the Coccinellid, *Chilocorus bipustulatus*, L., were of no great importance in control.

Bishara (I.). **The Cotton Worm, *Prodenia litura* F., in Egypt.**—*Bull. Soc. ent. Egypte* **18** no. 3 pp. 288–420, 11 pls., 7 figs., 4 maps, 31 diagr., 10 refs. Cairo, 1934.

The geographical distribution of *Prodenia litura*, F., is shown, all stages are described, and a list is given of 42 food-plants in Egypt, where there are usually 7 or 8 generations in the year. Four of these are found on berseem [*Trifolium alexandrinum*], the maximum flights occurring (in the southern part of the Delta) about 10th October, 20th November, 5th March and 5th May. The October brood may be troublesome also to maize. The June and July broods attack cotton, and the small seventh brood attacks maize and lucerne during late August and September. The June brood is much the largest [*cf. R.A.E.*, A **17** 418; **18** 241].

Observations at Giza during 1929–31 showed that one female may lay as many as 1,300 eggs in a single night and that the average oviposition period is 4–6 days. Oviposition continues almost throughout the year, but is at a maximum during June–August. Egg-masses usually contain 300–600 eggs. On cotton, they are generally laid on the leaves. They hatch in 4–9 days in summer and 11–22 in winter.

The larval and pupal periods lasted 15–23 and about 8 days, respectively, in summer, and 65–90 days and about 1 month in winter. The whole life-cycle ranged from 1 month in summer to 4–5 in winter. During July, the relative humidity had practically no effect on hatching, but the percentage of emergence from pupae ranged from 40 at 10 per cent. humidity to 80 at 100 per cent. [*cf.* **18** 241]. The moths were attracted to irrigated fields, where the humidity was high. Eggs and larvae developed most rapidly at temperatures above 24°C. [75·2°F.], and pupae at 30–35°C. [86–95°F.]. As temperatures above 34°C. [93·2°F.] caused a very high mortality among eggs and newly hatched larvae, the optimum is 28–30°C. [82·4–86°F.]. The absolute minimum temperature at which *P. litura* can survive is −2°C. [28·4°F.], but the mean minimum winter temperature at Giza is several degrees higher than this. The following exposures proved lethal: for eggs, 40°C. [104°F.] for 2 days and 45°C. [113°F.] for 7 hours; for larvae, 40°C. for 22–50 hours and 45°C. for 5–10; for pupae, 42·5°C. [108·5°F.] for 2 days and 48°C. [118·4°F.] for 80 minutes. Hot weather is to be regarded as one of the most efficient factors in the natural control of *Prodenia* [*cf.* **22** 12].

Egg-masses appear on cotton in May–June, and in the northern Delta a second brood in late July and early August may also be injurious. The larvae feed on the leaves, but do not attack the larger veins. After the first instar, they disperse widely and sometimes attack the young buds or bolls. The general effect of infestation is to weaken and retard development, so that the bolls appear late and are very liable to damage by bollworms [**16** 117]. Tours made during 1930 and 1931 showed that infestation by *Prodenia* is generally infrequent and light in the south of the Delta, but that it is almost universally found in the north. Though hand-collection of egg-masses and larvae reduces the damage, a heavy infestation has sometimes reduced the yield of cotton by over 80 per cent.

Berseem is also attacked more severely in the northern districts. If it is still in the seedling stage during September and October, it is often completely destroyed, but larger plants infested during October and November lose their small leaves only. Similar damage is done to lucerne. Injury to maize in August and September, although invariably local, is occasionally serious. It is sometimes associated with infestation by *Laphygma* (*Caradrina*) *exigua*, Hb. The larvae of *Prodenia* on ground-nuts, which they sometimes defoliate, can be controlled by dusting with calcium arsenate.

Of the parasites of this Noctuid in Egypt, only *Tachina larvarum*, L., is of any importance. In the laboratory, the egg and larval stages together lasted 12–14 and 20–21 days in September–October and November–December, respectively, and the pupal 14 and 20–34; in the field, the pupal period averaged only 8 and 12 days. On maize, this Tachinid was only important during September and October, when it caused 40–50 per cent. parasitism. On berseem, there was no parasitism during November and December, 12 per cent. during October, and only 1 per cent. in May and June. On cotton in June–August, it parasitised 5 per cent. of the larvae. Other parasites observed were *Actia* (*Gymnopareia*) *aegyptia*, Villen., an unidentified Tachinid, and a Chalcidoid that was bred from the pupae. Predators included *Coccinella undecimpunctata*, L., *Cydonia* (*Chilomenes*) *vicina*, Muls., *Paederus fuscipes*, Curt., *Labidura riparia*, Pall., and the spider, *Chiracanthium isiacum*, Cb. The larvae are liable to attack by bacteria

[**20** 245] and fungi [**22** 12]. In July–August, September–October, and November–December, 24, 98 and 90 per cent. respectively of larvae bred in the laboratory were killed by disease. Over 40 per cent. of the laboratory-bred pupae were also destroyed. The mortality due to disease among larvae and pupae collected in the field was generally from 14 to 53 per cent. lower.

In order to check the brood on berseem that gives rise to the moths that oviposit on cotton in June, a law was passed in 1913 forbidding the watering of berseem after 10th May [**18** 673]. This measure seems to be undoubtedly beneficial, but the law is almost universally evaded by small farmers. If berseem is attacked in June, it should be cut and the land ploughed and hoed. Migration of the larvae to neighbouring cotton should be prevented by surrounding the berseem field with ditches of water on which a film of kerosene is floated. Chemical control cannot be employed on berseem, but if the field can be flooded, the larvae can be swept from the surface of the water with a net. On cotton, the author considers that dusting with calcium arsenate should supplement the hand-collection of egg-masses. Infestation by *Aphis gossypii*, Glov., however, is more severe on leaves that have been too thickly dusted. Experiments indicating the efficiency of dusting are described and estimates of the cost are given. On maize, where insecticides cannot be used, the measure recommended is to wet the soil and sweep the caterpillars into the mud by brushing with palm leaves. The maize soon recovers.

Appendices give the text of two laws dealing with control measures against *Prodenia*, and a list of infestations reported in Egypt from 1913 to 1933.

Pospelov (V. P.). **The Conditions of Sexual Maturation in the Migratory Locust.**—*Bull. ent. Res.* **25** pt. 3 pp. 337–338, 7 refs. London, September 1934.

After reviewing previous work on the effect of temperature on the maturation of *Locusta migratoria*, L. [*R.A.E.*, A **14** 226, 395], the author suggests that this factor alone is not sufficient to induce sexual maturation in the females. In an experiment in Russia, female locusts caged with males during May–July at 21–40°C. [69·8–104°F.] matured their eggs normally in July and died after ovipositing. In females caged alone under identical temperature conditions maturation of eggs did not occur until August, when they were allowed to pair with males. The latter mature during the first days of the adult stage. The mechanism of fertilisation is discussed [*cf.* **18** 135], and it is suggested that the maturation of the eggs is connected with the penetration into them of the fertilising fluid.

Rubtzov (I. A.). **Fertility and Climatic Adaptations in Siberian Grasshoppers.**—*Bull. ent. Res.* **25** pt. 3 pp. 339–348, 20 refs. London, September 1934.

A list is given of 23 species of Acridids common in East Siberia, classified into four groups according to their moisture requirements. The potential fertility of a given species, as determined by dissecting the ovaries and counting the eggs, is more or less stable, and there is no correlation between it and the abundance of the species in nature. On the other hand, the number of egg-pods and of eggs in each pod

varies with the food and climatic conditions of each habitat, and most species have adaptations in the ovaries, enabling them to take full advantage of the seasonal warmth. Thus the actual fertility depends to a very great extent on the environment. It is greatly reduced by parasites, of which *Blaesoxipha* spp. and *Mermis* spp. are the most important, and is on the whole lower in permanent habitats than elsewhere. Lack of food can lower it by 30 to 40 per cent. It is concluded, however, that fluctuations in fertility never have any real importance in causing the outbreaks, which are determined primarily by the climatic and microclimatic conditions. Lack of food, and parasites, predators and diseases are of minor importance, and among the latter the main factors are the diseases of the egg-pod, which again depend on the microclimate.

Parsons (F. S.) & Ullyett (G. C.). **Investigations on the Control of the American and Red Bollworms of Cotton in S. Africa.**—*Bull. ent. Res.* **25** pt. 3 pp. 349–381, 1 pl., 12 diagr., 10 refs. London, September 1934.

A full account is given of the results of extensive investigations, already noticed from a less detailed source [*R.A.E.*, A **22** 225], on *Heliothis obsoleta*, F., and *Diparopsis castanea*, Hmps., attacking, principally, cotton in the Transvaal during 1929–32. Methods are described by which an intensive study was undertaken of the course of activity of *H. obsoleta* on numerous rain-grown and irrigated crops. They were developed primarily for the evaluation of the usefulness of *Trichogramma luteum*, Gir., and certain other egg and larval parasites of both bollworms when released experimentally, and later extended to provide continuous quantitative data on the relation of the bollworms to their food-plants.

Natural enemies of *H. obsoleta* [*cf. loc. cit.*] included the following: the Tachinid, *Gonia bimaculata*, Wied., which was reared from 2 per cent. of larvae from cotton in 1931 and is a parasite of *Euxoa segetum*, Schiff., which was then present; a Bombyliid, which attacked 27 per cent. of larvae on maize in 1932, but was rare in rain-grown cotton and maize in 1933; the Ichneumonid, *Metopius discolor*, Tosq., which occurred rarely in 1933; a Scelionid of the genus *Phanurus*, which was only found in abundance in winter crops, but then sometimes parasitised upwards of 50 per cent. of the eggs; an Anthocorid, *Orius* sp., which destroys 40 per cent. of the eggs on rain-grown crops (particularly cotton and maize) in summer, and is found occasionally on irrigated crops in winter; and ants, mainly *Pheidole* spp., which are among the chief predators and are common in fields of maize and cotton, particularly the former. Predators are stated to be the most important agents in natural control.

Pearson (E. O.). **Preliminary Observations on Cotton Stainers and Internal Boll Disease of Cotton in S. Africa.**—*Bull. ent. Res.* **25** pt. 3 pp. 383–414, 2 pls., 1 map, 15 diagr. London, September 1934.

Details are given of abundant records taken during 1931–33 and noticed from a briefer account [*R.A.E.*, A **22** 226] on the incidence of *Dysdercus intermedius*, Dist., *D. nigrofasciatus*, Stål, and *D. fasciatus*, Sign., on cotton and numerous alternative food-plants in several areas

of South Africa. Weekly records of damage revealed a marked relation between the number of punctures per boll and the percentage of staining, which has, however, proved difficult to correlate with the populations of the stainers, except in the case of young bolls. The relation of the stainers to *Nematospora gossypii* and *N. coryli*, of which the former is the commoner, is discussed, and the aetiology of the diseases caused by these fungi and their progress within the boll are described.

WILLIAMS (C. B.). **Field Studies on the Relation of Insect Pests to Climatic Conditions, with special Reference to Cotton.**—*Rep. 2nd Conf. Cott. Gr. Probl.* pp. 111–125, 3 figs. London, Emp. Cott. Gr. Corp., 1934.

It is probable that most variations in the numbers of insects, including those directly due to natural enemies, are ultimately attributable to climatic conditions. In order that the results of laboratory work may be of practical value, observations on a particular project should be carried out over long periods and with the greatest possible accuracy. They should include studies of the insect, and its variation in numbers, activity, and stages of development, of as many of the climatic factors as possible, and of the development of the crop concerned and other major alternative food-plants of the pest; and a general survey should be made of the climatic relations of the crop in different parts of the world and the status of the pest under the varied conditions. The results of studies in Egypt [*R.A.E.*, A **14** 199] on the pink bollworm [*Platyedra gossypiella*, Saund.] and the relation of cotton to climate are given as examples of what can be learnt by the collection of continuous records over long periods under standardised conditions.

In introducing his paper, the author gave a brief outline of a result obtained in investigations in England in which an attempt was made to introduce into the field study of the relation of insects to climate the degree of accuracy obtainable in the laboratory. The activity of the insects was recorded by a special light-trap that separated those caught at different periods during the night [**22** 517], and all the climatic factors were noted over a period of nearly 18 months. It was found that on days of the same maximum temperature, there was a very close correlation of insect activity with the height of the minimum temperature; on days of the same minimum temperature, there was a negative correlation with the previous day's maximum temperature. This illustrated the absolute necessity of sorting out the inter-correlations of the climatic factors before any one of them could be correlated with insect abundance.

In the discussion, the author pointed out that the occurrence of long-cycle larvae of *P. gossypiella*, which remain in a resting stage between the double seeds for 6–18 months, appears to depend largely on climatic conditions and to be confined to drier areas. The resting stage occurs in Egypt and apparently in the Punjab, and, during the hot weather, in the Sudan, but is non-existent in the West Indies and practically so in Coimbatore (Madras). H. R. Stewart stated that the meteorological conditions in localities in the Punjab in which *P. gossypiella* was a serious pest were totally different from those in localities in which it was less injurious. Indications have been obtained of the apparent infertility of a relatively high proportion of the male moths where the incidence of the bollworm was low and conditions were recorded as unfavourable. S. H. Evelyn remarked that damage

to cotton by *P. gossypiella* has been almost entirely prevented in St. Vincent by changing the date of planting the crop from June to September [*cf.* **19** 117]. R. Thomas discussed the effect of climate on the whitefly [*Bemisia gossypiperda*, Misra & Lamba] on cotton in the Punjab [**20** 554] and Sind, and W. L. Balls stated that it affected the leaf-curl disease in Africa in that it was transmitted by this Aleurodid to cotton in the Sudan, but only to hollyhocks [*Althaea rosea*] some 2,000 miles north in Egypt.

HARGREAVES (H.). **Climatic and Soil Factors in Relation to Prevalence of, and Damage by, Insects ; Possibilities of Reduction of Loss of Crop due to Insects, by the Selection and Restriction of Sowing Periods and by the Propagation of Cotton Strains better adapted to local Conditions.**—*Rep. 2nd Conf. Cott. Gr. Probl.* pp. 125–131. London, Emp. Cott. Gr. Corp., 1934.

Certain conditions of soil and climate are considered to bring about radical changes in the composition of the sap of cotton, increasing its attractiveness to insects and stimulating their rapid reproduction. Of the pests attacking cotton in Uganda, *Lygus vosseleri*, Popp., which may destroy about 25 per cent. of the crop in certain seasons, usually appears in the fields and causes damage during, or just after, periods of rainy weather, when rapid and possibly unhealthy growth of the aerial parts of the plant occurs. Its incidence is usually much higher on land that has been under continuous cultivation for several years. Observations have indicated that cotton is rendered susceptible to attack by *Helopeltis* by a reduction in the supply of water to the aerial parts caused by actual scarcity of soil moisture or by inability of the roots to function properly [*cf. R.A.E.*, A **22** 197] in a shallow or water-logged soil or in one with a hard layer. Dry conditions favour the rapid increase of *Aphis* [*gossypii*, Glov.] on young plants, but rain causes an almost immediate reduction in its numbers, which may be continued further by an entomogenous fungus. The small development of the root system of the young plants may be responsible for their susceptibility. The damage due to the boll-rots introduced by *Dysdercus* spp. is more serious during cooler and wet periods, though the bugs themselves are not necessarily more abundant. The prevalence of an undetermined Tetranychid, which causes yellow mottling of the leaves and finally their death, appears to be correlated with poor soil and dry weather. Jassids [*Empoasca facialis*, Jac.] are usually most prevalent on cotton growing on poor soil with an inadequate supply of water during dry weather [*loc. cit.*], the effect of which on the plant may have been erroneously ascribed to the insects. The author attributes the fact that certain varieties apparently suffer less from infestation by Jassids to their greater adaptability to a particular environment and their resistance to drought. The cultivation of " Jassid-susceptible " cottons (possibly of greater value) in somewhat drier areas might perhaps be rendered practicable by an increase in humus or by cultural conservation of moisture.

A continuous source of food is supplied for cotton pests by a prolonged, and particularly by an early sowing period, and by the use of strains that take unusually long to mature. It is therefore suggested that a reduction in the sowing period in Uganda from 5 to 4 months in normal years and the cultivation of quickly maturing strains would

result in a marked reduction in damage and possibly allow of later sowing and an extension of the close season.

In the discussion, F. R. Parnell stated that at Barberton (Transvaal) the worst attacks by the Jassid occurred after heavy rains ; infestation also appeared to be connected with poor or water-logged soil. In his experience, resistance did not appear to be due to better adaptation to environment, as strains of cotton introduced from other countries grew well and were not affected by drought, though they invariably succumbed to the Jassid. Their only defect was a lack of dense hairs on the leaves, which on other varieties appear to interfere with the feeding of the nymphs. During experimental work, a close connection was observed between hairiness of the foliage and resistance to infestation [**16** 350]. Moderately susceptible varieties appear to be attacked when the crop begins to ripen, but very susceptible ones are infested before then. The insects do not appear to be attracted to plants showing vigorous vegetative growth, or to breed on them. Plants carrying a very small crop are markedly less susceptible. R. Thomas remarked that in the Punjab and Sind attack by Jassids [? *Empoasca* sp.] was noticeable very shortly after the beginning of the rains, and that the effects seemed to disappear about the end of September, though the insects were still present. According to W. L. Balls, heavy infestation of part of a field by *Aphis* [*gossypii*] at Giza (Egypt) was found to be connected with an unhealthy condition of the plants due to the presence of a layer of clay through which the roots penetrated with difficulty. Differences in the growth of the plants could be observed as their roots reached layers of the soil of different composition. In the opinion of C. B. Williams, agricultural and ecological measures of control are only of value if the optimum environmental conditions of the pest differ from those of the plant ; direct measures are required where the optimum conditions are identical or entirely unrelated.

Investigations on Insect Pests of Cotton.—*Rep. 2nd Conf. Cott. Gr. Probl.* pp. 131–167, 2 figs., 2 refs. London, Emp. Cott. Gr. Corp., 1934.

Under this heading are included two papers (with comments on them by F. S. Parsons), *viz.*, Investigations on the American and Red Bollworms of Cotton [*Heliothis obsoleta*, F., and *Diparopsis castanea*, Hmps.], by F. S. Parsons and G. C. Ullyett (pp. 135–146) and Investigations on Cotton Stainers [*Dysdercus* spp.] and Internal Boll Disease, by E. O. Pearson (pp. 146–155), that are summaries from reports from South Africa [*R.A.E.*, A **22** 225, 226] and contain information similar to that noticed above [**22** 676]. In The Interrelationship of wild Host Plants and Cotton with Reference to Variation in Stainer Population in Northern Rhodesia, by A. G. Bebbington and W. Allan (pp. 156–165), an outline is given of the results obtained after 5 years' work on the identity and distribution of the alternative food-plants of *Dysdercus* spp. and their relation to the cycle of the bugs on cotton [*cf.* **21** 158 ; **22** 227]. The migration of *D. superstitiosus*, F., from early flowering *Hibiscus* spp. (especially *H. trionum*) and from *Thespesia rogersi* to cotton usually begins in February. It does not appear to be directly associated with the flowering of the cotton, but apparently coincides with the drying up of the early flowering food-plants after a generation has matured on them. A

return migration to the later flowering species of *Hibiscus* (especially *H. asper*) begins in mid-May, after which this stainer is seldom found on cotton. It disappears completely from *H. asper* in September, reappearing on *Thespesia*, etc., in November with the beginning of the early rains. In view of its probable need for fairly humid conditions [*cf.* **21** 484], it may pass the exceedingly hot and arid months of September and October on *Hibiscus* growing in wet situations. *D. fasciatus*, Sign., begins to leave *Thespesia* on the rotting and shedding of the old bolls in late February or early March and appears in increasing abundance on cotton during late March and early April [*cf.* **22** 227]. At this period, it is usually diverted by the newly maturing second crop of *Thespesia*, which is more attractive than cotton. Sometimes, however, it is forced to feed on cotton owing to the shedding of all the buds of this crop consequent on infestation by the larvae of a Cossid. In introducing the paper, C. J. Lewin stated that, where cotton was grown for one year only in an area free from *Thespesia*, the stainers appeared too late on the crop to cause any damage.

In the discussion that followed, Sir G. Evans stated that in Queensland the early crop planted during the light rains at the end of September produces short stocky plants that are only slightly damaged by *Heliothis* [*obsoleta*, F.], whereas the late crop planted during the heavy rains at the end of November or December grows luxuriantly, and the first and second pickings are severely injured by the bollworm as soon as the maize planted at the same time is cut. The use of trap-crops of maize [*cf.* **22** 225] proved impracticable owing to local difficulties in settling the date of cutting and carting. In reply to his question on the distance covered by adults of *Dysdercus*, F. S. Parsons said that they can probably fly a mile or more, although possibly not in one flight. In the Transvaal there are apparently large forests of baobab (*Adansonia digitata*) on which it is possible that *D. fasciatus* may pass part of the year. Their most southerly limit is only 50–60 miles directly north of Barberton, and a migration may take place to this locality, particularly as other alternative food-plants have been discovered in the intervening area.

Bedford (H. W.). **Problems connected with the Control of the Pink Bollworm** (*Platyedra gossypiella*, **Saunders**) **in the Sudan.**—*Rep. 2nd Conf. Cott. Gr. Probl.* pp. 167–175. London, Emp. Cott. Gr. Corp., 1934.

In introducing this paper, W. P. L. Cameron stated that in the absence of practical methods of controlling *Platyedra gossypiella*, Saund., during the growing of the cotton, and owing to the failure of biological control by means of *Microbracon kirkpatricki*, Wlkn. [*cf. R.A.E.*, A **20** 622], regulations were drawn up in the Anglo-Egyptian Sudan dealing with the storage of the seed, the growing and disposal of the crop and the establishment of a "dead season" of at least 2 months. The author points out that since their enforcement *P. gossypiella* has only proved important in areas in which it can survive between seasons in seed cotton and cotton seed stored in native houses in connection with the local spinning and weaving industry. A considerable amount of this material consists of the latest pickings of the crop and in consequence contains large numbers of bollworms [*cf.* **21** 544]. Measures taken to prevent its storage are briefly described. In the Gezira, about 15,000 lb. seed collected

after the compulsory date for ginning seed cotton, contained an estimated number of over 60,000 living bollworms. The demand for seed cotton should be prevented, either by the prohibition of the native spinning industry or by the adoption of ginned cotton for this purpose. Cameron also remarked that the period at which the larvae that undergo a resting period are produced varies according to the date of sowing and the age of the crop and appears to be influenced by chemical changes in the composition of the food that take place as the plant reaches maturity. In the northern Sudan, moths arising from the long-cycle larvae emerge chiefly from mid-July to the end of September (the rainy season).

In the discussion that followed, W. L. Balls gave a brief outline of work being carried out in Egypt by I. Bishara on infestations by *P. gossypiella* derived from cotton sticks [*cf.* **12** 281]. The area surveyed was gradually increased from 1 to about 19 sq. miles, in which no cotton sticks were stored, whereas in an adjacent area they were left undisturbed. Counts taken during 5 successive years showed that infestation of the green bolls was reduced by half with every 220 yards increase in distance from a place where sticks were stored.

BAILEY (M. A.). **Leaf Curl Disease of Cotton in the Sudan.**—*Emp. Cott. Gr. Rev.* **11** no. 4 pp. 280–288. London, October 1934.

The history of leaf-curl of cotton, transmitted by *Bemisia gossypiperda*, Misra & Lamba, in the Gezira District of the Sudan, and of attempts to control it is briefly outlined [*R.A.E.*, A **19** 709, etc.]. The practice of rotating crops of cotton with lubia (*Dolichos lablab*) was abandoned [**21** 582], because the lubia concealed the ratoon, and the disease was so passed to the new crop of cotton. A tool was devised to make the cutting out of ratoon more efficient, with the result that the next crop was almost entirely free from disease. In wet weather, however, the ratoon survived in greater quantities, and was concealed by weeds. Direct control of the vector is hardly practicable, and the ratoon is never completely kept under; but attempts to obtain by selection strains of cotton highly resistant to the disease have given promising results, two of the strains (X 1530 and X 1730) of Sakel [*Gossypium peruvianum* × *barbadense*] being only slightly susceptible [*cf.* next paper].

COWLAND (J. W.). **Gezira Entomological Section, G.A.R.S. Final Report on Experimental Work, 1932–33.**—*Ann. Rep. Gezira agric. Res. Serv. Sudan Govt 1933* pp. 107–125, 1 graph. [Wad Medani, 1934.]

On lubia (*Dolichos lablab*) sown during May and June 1932 in the Sudan, *Bemisia gossypiperda*, Misra & Lamba, was numerous only during October and November. Apparently, however, it was not controlled by parasites early in the season either on lubia or on cotton, although after the winter its development on cotton was effectively checked by *Eretmocerus diversiciliatus*, Silv., *Prospaltella* sp. and *Encarsia* spp. A soda-resin spray [*R.A.E.*, A **20** 554] used against the nymphs of *Bemisia* was not very efficient, and the sprayed plants were immediately re-infested by adults. Similarly cotton treated with a spray of castor oil and resin emulsified with ammonia [**17** 504] was at once re-infested by adults, and the control of the nymphs was offset by the

scorching of the leaves. In experiments on leaf-curl, 2–15 whiteflies caged on single leaves of susceptible and resistant varieties of Sakel cotton [*Gossypium peruvianum* × *barbadense*] for 4 days failed to transmit the infection. When large numbers of infected whiteflies were fed for 1–9 days on lubia and uninfected Sakel plants and then transferred to healthy Sakel seedlings, the disease was successfully transmitted to the latter. Sakel plants only became infective one day before the veins were visibly thickened. Although cotton is susceptible at all stages, leaf-curl is delayed in older plants, sometimes until the secondary growth has begun. A resistant variety of cotton (XH 1029) maintained its resistance whatever the source of infection. The percentages of transmission experiments to susceptible cotton that were successful were : 100 from susceptible cotton ; 43 from the resistant variety ; 9 from *Hibiscus esculentus*, which is itself resistant ; and 100 from *H. cannabinus*, which is very susceptible. Experiments to find out whether certain weeds are symptomless carriers of the disease gave negative results. Tests showed that new varieties of cotton bred for their resistance to leaf-curl [*cf.* preceding paper] were able to maintain their resistance at all stages of their development. The percentage of infection for X 1530 sown early (11th August) was 0·5 in November, 1·5 in December, and 6 in March, as against 56, 84·5 and 93 for Gezira Main Crop. Crops sown later (1st September) were slightly more liable to infection. American cotton [*G. hirsutum*] on an experimental plot showed less susceptibility than Sakel sown at the same time. The percentage of infection was least in the latest of the three crops sown.

Further experiments supported the conclusion that *Hercothrips sudanensis*, Bagn. & Cam., can survive the inclement period from June to August in the soil [**21** 583], but also suggested that frequent irrigation during October and early November would greatly reduce the damage that this thrips does to cotton. Among other pests of cotton mentioned [*cf.* **21** 583], *Frankliniella dampfi*, Pries., is the most important. Its eggs are laid in the tissue of tender stalks, the larvae avoid light and feed on the youngest leaves, and the pupae seem to be able to pass the dead season in the soil. The life-cycle lasts about 3 weeks. The Capsid *Campylomma nicolasi*, Puton & Reut., damages the young leaves, the brown areas where it has fed dropping away from the rest of the leaf. Larvae of *Heliothis obsoleta*, F., appeared on weeds in September, and in October they were numerous on cotton, attacking the buds and young squares. The moths emerged in December, and until the middle of January the larvae were numerous on *Dolichos lablab* ; after January, they seem to be controlled by a Tachinid parasite. A chart of the incidence of *Platyedra gossypiella*, Saund., in the Sudan from 1928–1933, shows that infestation reaches its maximum in February and March, decreases rapidly in April and begins anew in November–December.

STOREY (H. H.). **Report of the Plant Pathologist.**—*Rep. E. Afr. agric. Res. Sta. Amani* **6** (1933–34) pp. 10–14. London, H.M.S.O., 1934.

Further experiments at Amani on *Cicadulina mbila*, Naudé [*cf. R.A.E.*, A **21** 486] have left the author undecided whether the fact that this Jassid remains able for long periods to infect plants with streak disease of maize without receiving additional supplies of the

virus should be explained by the theory of internal multiplication of the virus.

An experiment in which several thousands of an unidentified species of Aleurodid were released in a chamber containing cassava infected and uninfected with mosaic resulted in the rapid infection of all the plants. Whiteflies confined with single leaves failed to transmit the infection, but carefully controlled experiments appeared to establish this species as a vector [*cf.* **20** 628 ; **22** 251].

HUTSON (J. C.) & DE ALWIS (E.). **Two Weevil Pests of Mango Leaves.** —*Trop. Agriculturist* **83** no. 2 pp. 128–135, 2 pls., 12 refs. Peradeniya, August 1934.

Considerable damage to mango in Ceylon has recently been caused by *Deporaus* (*Eugnamptus*) *marginatus*, Pasc. (mango leaf-cutting weevil) and *Rhynchaenus mangiferae*, Mshl. (mango flea-weevil), which had previously been regarded as minor pests. All stages of both species are described. *Rhynchaenus* is more numerous in the northern dry zone, *Deporaus* in the wet zone. The larvae of both mine in the leaves, causing brown blotches, and the adults feed on the epidermis and leaf tissues of young foliage, so that the injured leaves turn brown and curl up.

The eggs of *Deporaus* are laid in the fleshy part of the mid-rib of the leaf, usually on the upper side, about ½ inch apart. The female then cuts the leaf right across about 3 inches from the stalk, so that the part containing the eggs falls to the ground. The eggs hatch in 2–2½ days, and the larval and prepupal periods total 10–12 days. The larvae can complete their development in shrivelled leaves, provided that there is sufficient moisture to prevent them from drying too quickly, but larvae have not been observed in Ceylon to develop on leaves attached to the stalk or to rest underground [*cf. R.A.E.*, A **6** 124]. The pupal stage, in cells just below the surface of the soil, occupies 11–12 days. The life-cycle of 22 individuals in captivity averaged 24½ days ; three females lived about 12 weeks and laid 74, 109 and 218 eggs. It is not known if breeding continues throughout the year in Ceylon. The measures recommended are to burn the cut leaves daily and to spray with 1 oz. lead arsenate to 2 gals. water.

The eggs of *R. mangiferae*, which are laid singly in pockets, generally excavated in the lower surface of the leaf near the edge, hatch after about 3 days. The infested leaves remain on the tree, and the larvae pupate in cocoons in them. The larval and pupal stages last 3–4 and 2½–3 days, respectively. The lead arsenate spray recommended against *D. marginatus* should be applied as soon as the young leaves and blossoms appear.

BARANOV (N.). **Zur Kenntnis der parasitären Raupenfliegen der Salomonen, Neubritanniens, der Admiralitäts-Inseln, der Fidschi-Inseln und Neukaledoniens, nebst einer Bestimmungstabelle der orientalischen *Sturmia*-Arten.** [A Contribution to the Knowledge of the Parasitic Diptera of the Solomon Islands, etc., with a Key to the Oriental Species of *Sturmia*.]—*Vet. Arhiv* **4** pts. 10–11 pp. 472–485, 4 figs. Zagreb, 1934. (With a Summary in Serbian.)

The new species described include *Sturmia chatterjeeana* from *Nygmia* (*Euproctis*) *bipunctapex* Hmps., in the United Provinces, India.

Ramakrishna Ayyar (T. V.) & Anantanarayanan (K. P.). **Insect Phototropism and its Economic Importance in India.**—*Madras agric. J.* **22** no. 8 pp. 268–273, 11 refs. Coimbatore, August 1934.

Insects caught in light-traps at Coimbatore included the rice Pyralids, *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), *Chilo*, *Diatraea* and *Ancylolomia chrysographella*, Koll. Among the Orthoptera, *Gryllotalpa* was very common. The potential value of light-traps against various pests in India is discussed. Preliminary investigations on *S. bipunctifer* in Madras showed that at the peak of emergence every fresh brood is highly phototropic at all hours, even on moonlit nights. Most of the females trapped were gravid, and females generally outnumbered males, though the ratio varied locally and from season to season. During the rice season, the moths were first found in the traps during transplantation.

Cherian (M. C.). **Mites on Sugarcane.**—*Madras agric. J* **22** no. 8 p. 285. Coimbatore, August 1934.

In July 1933 and 1934, *Paratetranychus indicus*, Hirst, attacked sugar-cane in Coimbatore. The symptoms of infestation are the same as those on *Sorghum* [*R.A.E.*, A **21** 501].

Dover (C.) & Mathur (R. N.). **Methods of Testing the Susceptibility of Timbers to Termite Attack.**—*Indian For. Rec.* **20** pt. 7, 20 pp., 9 refs. Delhi, 15th August 1934. Price 6*d*.

A survey was made of termite activity in buried wood in an experimental " graveyard " in Dehra Dun (United Provinces), and experiments were carried out to improve the tests for natural resistance among various types of timber and the efficiency of preservatives. Several factors affecting termite-exposure tests are considered, and the technique for future tests discussed.

The following is taken from the introduction, by C. F. C. Beeson, and the author's abstract : termite activity varies considerably from season to season, and is stimulated by ascending humidity (July to October) and reduced by cold and by dry heat. Field experiments should be started just before an increase in rainfall is due. The density of termite populations is increased by regular increase in food-supply, such as additions of wood to test plots. These do not significantly diminish the density of termites on wood already present, although the progressive density per unit of food may be retarded. The population increases up to the capacity of the food-supply. The proximity of test pieces of preferred woods increases the intensity of attack on more resistant species. Partly buried stakes were more suitable for field tests than cubes. For natural resistance trials, the test-pieces should be arranged close together so that their surface area occupies most of the plot, which should be baited with susceptible wood three months beforehand. During the experiment, these baits should surround and be interspersed with the test pieces, but they should not be added to after the test has begun. The number of test-pieces should be constant for each unit of a series of related experiments. For preservative efficiency tests, similar field experiments should be made together with a parallel series using cubes in covered trays. A method for evaluating relative durability and natural resistance is described. Similar methods

apply in preservative efficiency tests. The applicability of results is strictly limited to particular climatic zones. Preliminary baiting is important to enable the species of termite involved to be determined. For termites injuring timbers in buildings, studies based on laboratory colonies are desirable.

Hill (G. F.) & Holdaway (F. G.). **Observations on the Use of Zinc Chloride for Soil Treatment in the Control of Termites.**—*J. Coun. sci. industr. Res. Aust.* **7** no. 3 pp. 169–172, 2 refs. Melbourne, August 1934.

To control an infestation of stored wheat in the Federal Capital Territory by *Eutermes exitiosus*, Hill, which had tunnelled from the ground into the grain, the soil was treated with zinc chloride. This relatively non-poisonous material was selected as a repellent in view of the danger of using sodium arsenite, especially in the quantities necessary for soil treatment. The wood was removed from the granary floor, and the soil, a clay loam with clay near the surface, was thoroughly moistened. On 20th October the earth was sprayed with a 10 per cent. solution of fused zinc chloride at the rate of 0·8 oz. zinc chloride per sq. foot. A week later the termites had attacked the replaced boards. On 13th November the treatment was repeated, but a 20 per cent. solution was used to give an average concentration of 3·25 oz. per sq. foot with a penetration of 1 inch. This treatment acted as an adequate repellent, and a week later no termites were found in the granary, but it was noticed that activity had been renewed on a mound near by, the only one in the neighbourhood. The termites in the mound were destroyed by 1 oz. Paris green.

China (W. E.) & Myers (J. G.). **Critical Notes on some Neotropical Species of *Tomaspis* (Homoptera, Cercopidae).**—*Ann. Mag. nat. Hist.* (10) **14** no. 82 pp. 448–466, 7 figs. London, October 1934.

In the course of investigations on *Tomaspis saccharina*, Dist. (sugar-cane froghopper) in Trinidad, other species of this genus were studied in Trinidad and in northern South America. This paper deals with the classification and synonymy of 19 species (including 5 new ones) ; they are divided, chiefly on the basis of the male genitalia, into three groups, excluding a few isolated species.

Carter (W.). **Notes on two Pests of Pineapple not known in Hawaii.**—*Proc. Hawaii. ent. Soc.* **8** no. 3 pp. 395–397, 2 figs. Honolulu, July 1934.

Metamasius ritchiei, Mshl., bores through the stem of fruiting pine-apple plants in Jamaica, traversing the fruit and completely destroying it. Young suckers are attacked [*cf. R.A.E.*, A **5** 8, etc.], the borings reaching the growing point, and larvae may also be observed in stumps already containing old borings. This weevil is confined to one densely wooded, very humid locality, which suggests that it would not readily adapt itself to the conditions of Hawaii, but its restricted distribution may be due to the presence of dense tropical vegetation separating the plantings.

The larvae of a Lycaenid, identified as *Tmolus* (*Thecla*) *echion*, L., but apparently distinct from the species introduced from Mexico into

Hawaii against *Lantana* [**21** 93], are found at the base of young growing slips in Guatemala, boring at the attachment of the fruit or into the fruit itself [*cf.* **16** 158], but do not occur in large numbers.

Pemberton (C. E.). **Some Future Work for the Entomologist in Hawaii.**—*Proc. Hawaii. ent. Soc.* **8** no. 3 pp. 505–514. Honolulu, July 1934.

This Presidential Address, given to the Hawaiian Entomological Society in 1933, outlined various problems that merit investigation in connection with numerous insects of economic importance in the Islands.

Schmidt (C. T.). **The Immunity of** *Pseudococcus brevipes* **(Ckll.) to Parasitism by** *Coccophagus gurneyi* **Compere.**—*Proc. Hawaii. ent. Soc.* **8** no. 3 pp. 517–518. Honolulu, July 1934.

Examples of *Pseudococcus brevipes*, Ckll., obtained from pineapples in ship stores in California, were exposed to *Coccophagus gurneyi*, Comp., a parasite of *P. gahani*, Green [*cf. R.A.E.*, A **20** 594]. The Aphelinid was observed to oviposit readily in the mealybugs, but dissections showed that the embryo was destroyed either by phagocytosis or by action of the body fluids of the host.

Swezey (O. H.). *Harroweria gloriosa* **Hebard, a Katydid Stowaway from Panama (Orthoptera : Tettigoniidae).**—*Proc. Hawaii. ent. Soc.* **8** no. 3 pp. 529–531, 1 ref. Honolulu, July 1934.

Three examples of the Tettigoniid, *Harroweria gloriosa*, Hebard, were found in an orchid house in Honolulu in March 1933, having hatched from eggs in obscure punctures on a leaf of *Oncidium stipitatum* brought from Panama. There were about 12 such punctures, each containing 2 eggs. The leaf was kept in a container and the eggs allowed to hatch. The resulting nymphs fed readily on flowers of *Canna*, *Hibiscus*, hollyhock, *Dahlia* and *Datura arborea*, maturing in about 2 months. About 7 months had elapsed between oviposition and hatching.

Illingworth (J. F.). **Notes on the Habits and Life History of** *Sciara molokaiensis* **Grimshaw, a serious Pest of the Roots of Plants in Hawaii (Mycetophylidae).**—*Proc. Hawaii. ent. Soc.* **8** no. 3 pp. 535–539, 2 figs., 2 refs. Honolulu, July 1934.

The larvae of *Sciara molokaiensis*, Grimshaw, were discovered eating the root tips of pineapple and other plants in greenhouses in Hawaii, the life-cycle in the pineapple houses lasting about 24–30 days. They also attack the roots of pineapple in the field. One dead female was observed surrounded by 5 batches of about 20 eggs each at a depth of 6 inches in the soil of a root cage. The larvae hatched in 6 days and devoured first the egg-shells and then the body of the parent. Ovipositing flies were readily attracted to rotting stable manure. Many larvae may be destroyed by burning plant refuse, but if this is too dry, they will have left it. Flooding was found to kill the larvae, and if an extract of pyrethrum was added to the water, the adults avoided the treated soil.

VANDENBERG (S. R.). **Report of the Entomologist.**—*Rep. Guam agric. Exp. Sta.* 1930–31, 1931–32 pp. 20–22, 1 fig. Washington, D.C., August 1933. [Recd. October 1934.]

In breeding experiments in Guam, the normal viability of the eggs of *Pimpla* (*Exeristes*) *roborator*, F., an introduced parasite of the European corn-borer [*Pyrausta nubilalis*, Hb.] [*cf. R.A.E.*, A **20** 306] was 80 per cent., and that of eggs stored for from 5 to 15 days at 32–35°F. between 75 and 80 per cent. From larvae of *Pyrausta* brought from Japan in December 1930 at 38–45°F., 1,071 adults and 394 pupae of *Ceromasia senilis*, Mg. (*lepida*, auct.), 141 adults of *Cremastus flavo-orbitalis*, Cam. (*hymeniae*, Vier.) and 25 of *Eulimneria* sp. were obtained. A further 40 adults were obtained from 50 pupae of *Eulimneria*. Liberations of the two Ichneumonids were made, but it was not found possible to breed them. During July–December 1931, 15 generations of *Ceromasia* were reared in cages, and adults were liberated in 50 localities, so that they or their offspring reached all the maize in the Island. Migrations of $\frac{1}{2}$–$\frac{3}{4}$ mile were recorded. In 1932, this Tachinid survived the wet months July–December between the maize seasons in the field.

MILZER (A.). **On the great Abundance of the Black Widow Spider.**—*Science* **80** no. 2079 p. 403. New York, 2nd November 1934.

Lactrodectus mactans, F., is recorded in large numbers from Colorado, Kansas, New Mexico and Texas. Its most frequent prey in Denver, Colorado, was *Melanoplus bivittatus*, Say.

WHITEHEAD (F. E.). **The Effect of Arsenic, as used in poisoning Grasshoppers, upon Birds.**—*Bull. Oklahoma agric. Exp. Sta.* no. 218, 54 pp., 8 figs., 60 refs. Stillwater, Okla., June 1934. [Recd. October 1934.]

The author reviews the literature dealing with the possibility of domestic and wild birds being poisoned by feeding on bran baits used in control of grasshoppers or on the poisoned grasshoppers themselves [*cf. R.A.E.*, A **18** 452; etc.]. In Oklahoma, domestic fowls and quail confined without food for 24 hours and then supplied with bran poisoned with 4 per cent. white arsenic (As_2O_3), which was scattered about the pens at the rate of 100 lb. per acre, showed no indications of poisoning after 24 hours. When poisoned bran was forcibly administered, 74 mg. As_2O_3 proved slightly toxic to a 22-oz. fowl (*i.e.*, 3·363 mg. per oz. of bird weight).

When individual grasshoppers were caged with bran flakes of a selected standard size, each weighing approximately 2·337 mg. and containing 0·0935 mg. As_2O_3, the number eaten by one adult of *Melanoplus bivittatus*, Say, *M. femur-rubrum*, DeG., and *M. bispinosus*, Scud., averaged 8·05, 3·02 and 3·2, respectively. The reliability of these tests in indicating the arsenic content of poisoned grasshoppers was confirmed by analysis of 72 poisoned adults of *M. bivittatus*, which were found to contain an average of 0·75 mg. As_2O_3.

From a series of experiments in which 144 birds of various species were fed on grasshoppers, the following conclusions were drawn: fowls discriminate between poisoned and unpoisoned grasshoppers and

eat less than half as many of the former ; the amount of arsenic consumed by them in eating only poisoned grasshoppers averages less than half the toxic dose, and their weight and growth after 66 days is not materially affected ; quails eating a normal number of grasshoppers would, if the latter were poisoned, receive only from 1 to 7 per cent. of a toxic dose of arsenic ; there is practically no danger to adult wild birds from eating poisoned grasshoppers, though there may be slight danger to nestlings. Chemical analysis of the bodies of fowls that had eaten many poisoned grasshoppers showed that they could safely be used for human consumption.

SCHAFFNER (J. V.) & GRISWOLD (C. L.). **Macrolepidoptera and their Parasites reared from Field Collections in the north-eastern Part of the United States.**—*Misc. Publ. U.S. Dep. Agric.* no. 188, 160 pp. Washington, D.C., July 1934. [Recd. October 1934.]

A systematic list is given of Macrolepidoptera reared from field collections in the north-eastern United States between 1915 and 1929, with records of food-plants, distribution, the total number received, the seasonal occurrence of the stages, the insect and Nematode parasites of each species, and data showing the prevalence of the latter. A similar list is also given of the parasites (Diptera and Hymenoptera), with records of hosts, localities, the months in which the adults occur, the number of individuals to a host, the number of generations a year, the stage in which hibernation takes place and occasionally other general information. The technique used in handling the material is briefly described, and an index to species, arranged under genera, is appended.

Entomology and Limnology.—*Rep. Cornell agric. Exp. Sta.* **46** (1933) pp. 105–115. Ithaca, N.Y., 1934.

According to G. W. Herrick and G. H. Griswold, *Phenacoccus acericola*, King, has only one generation a year in central New York. This Coccid was abundant on sugar maples [*Acer saccharum*] in 1930 and 1931, but gradually disappeared during 1932 largely owing to the destruction of the egg-masses by the larvae of the Coccinellid, *Hyperaspis signata*, Ol. Work is in progress on the control of the columbine borer [*Papaipema purpurifascia*, Grote & Rob.] on columbine [*Aquilegia*].

G. F. MacLeod states that the commonest Mycetophilid found associated with injuries to potatoes was not *Pnyxia scabiei*, Hopk., but *Sciara pauciseta*, Felt [*cf. R.A.E.*, A **21** 686], though the former is reported to be the more injurious in other States. Damage by Mycetophilids was apparently completed relatively early, but that by millepedes and wireworms increased when potatoes were left late in the field. The gladiolus thrips [*Taeniothrips gladioli*, Moult. & Stnw.] was destroyed by fumigating the stored corms with naphthalene, paradichlorobenzene and [calcium] cyanide, naphthalene proving the most practical. At 55–65°F., the life-cycle lasted about 2 weeks. Young thrips were in the soil as late as November, but none was present in the spring.

Hopping (G. R.). **An Account of the Western Hemlock Looper, *Ellopia somniaria* Hulst, on Conifers in British Columbia.**—*Sci. Agric.* **15** no. 1 pp. 12–29, 2 pls., 1 graph, 4 refs. Ottawa, September 1934.

Of eight areas in British Columbia infested during 1928–29 by *Ellopia somniaria*, Hulst, that chosen for investigation was one 6 miles in length and varying in width from ¼ to ½ mile, in which 60 per cent. of the conifers were hemlock (*Tsuga heterophylla*) and 20 per cent. cedar (*Thuja plicata*). This Geometrid has one generation a year ; the winter is passed in the egg stage, and the larvae hatch in May or June and feed throughout the summer. Eggs were found in greatest numbers in moss on the limbs of trees or on the forest floor, but were also numerous on the lower surface of the needles of hemlock. Attempts to induce females to oviposit in captivity failed. Of eggs collected in the spring of 1930 and placed in the laboratory at 28°C. [82·4°F.], 49·5 per cent. hatched and 25·7 per cent. were parasitised by *Telenomus* sp. ; the remaining 24·8 per cent. probably represent the winter mortality. Measurements of the five larval instars are given. The larvae lived without food for 7–14 days, and can consequently move some distance to reach it when they hatch in an unsuitable place. A list of food-plants in order of preference is given, the preferred conifers being *Tsuga heterophylla*, *Abies grandis*, *Pseudotsuga taxifolia* and *Picea sitchensis*. Willow, *Vaccinium* and other deciduous trees and shrubs were also attacked. Larvae could not be reared in the laboratory on *Thuja plicata* or *Acer circinatum* alone, and would not eat *Spiraea* at all, though all these are defoliated in a heavy infestation. In fair weather, the larvae migrate by dropping on threads ; in rainy weather, they fed little and the mortality due to rainfall was considerable. They pupated in the field between 10th August and 10th September. Pupae collected from one end of the area, where the course of the outbreak was apparently a year behindhand, and from other parts were placed in separate cages. In both, males emerged earlier than females and were more numerous, the peak of emergence occurring in warm, dry weather. The following percentages were obtained from the two cages, which contained 7,500 and 7,000 pupae respectively : emergence of moths, 62·6 and 38·5 ; parasitism, 10 and 21·7 ; destruction by fungi or other causes, 27·4 and 39·8. In 1929, the flight-period lasted from 29th August to 17th November.

Three Diptera and 11 Hymenoptera were reared from *E. somniaria* in British Columbia, of which the most important was *Winthemia cilitibia*, Rond. This Tachinid oviposits on the caterpillar just behind the head, and the maggot penetrates the host and works towards the posterior. In the two experimental cages, 668 and 1,491 maggots left the pupal cases between 24th August and 24th September, mostly in wet weather. Other parasites of importance were *Hyposoter* sp., *Amblyteles cestus*, Cress., *Pimpla* (*Apechthis*) *ontario*, Cress., and *Telenomus* sp. Several birds were observed to prey on the caterpillars.

The difficulties of dusting from aeroplanes and devices for overcoming them are discussed, and an account is given of three dustings from the air made over infested areas in British Columbia. In 1929, 45 acres were dusted with calcium arsenate at the rate of 26 lb. to the acre, and in the autumn 800 acres in another locality were dusted with 18–20 lb. an acre, which was estimated to have destroyed about 75–85 per cent. of the larvae. In the third locality, a control of about 80–85 per

cent. was obtained. During all dustings, the conditions were favourable; there was a slant wind of about 3–5 m.p.h., a heavy dew on the leaves, and no rain fell for some days after. As the eggs of *W. cilitibia* are usually deposited after the third moult of the host larvae, which generally occurs after 7th July, it is important to complete dusting by the end of June. Details of the cost are given.

KEMP (H. J.). **Studies of Solid Stem Wheat Varieties in Relation to Wheat Stem Sawfly Control.**—*Sci. Agric.* **15** no. 1 pp. 30–38, 1 fig., 4 refs. Ottawa, September 1934.

Observations in Saskatchewan during 1930–32 showed that wheat with hollow stems [*cf. R.A.E.*, A **18** 121] is more susceptible to infestation by *Cephus cinctus*, Nort. (wheat-stem sawfly) than wheat with solid or partly solid stems. Experiments in forced infestation showed that solid stems are rarely and never dangerously infested. The solid node in a pithy stem prevents the larva from making its way to the base, where it should overwinter. Two out of five varieties of hollow-stem wheat were only slightly infested, but it is thought that their immunity was due to the unsuitable development of the plants under unnatural forced conditions at the time of oviposition. Moreover, although infestation in some of the solid stem varieties reached 18 per cent., no adults emerged in the following year. It is suggested that a solid-stem wheat yielding good flour might be found that could be grown in districts infested by *C. cinctus*, which may destroy as much as half the crop in some fields.

SANFORD (G. B.). **A Malady of the Potato in Alberta similar to Psyllid Yellows.**—*Sci. Agric.* **15** no. 1 pp. 46–48, 3 figs., 1 ref. Ottawa, September 1934.

A disease-like condition of potatoes that has been reported in several places in Alberta closely resembles "Psyllid yellows," which is associated in the United States with the feeding of the nymphs of *Paratrioza cockerelli*, Šulc [*R.A.E.*, A **21** 606; etc.]. Like Psyllid yellows, it was not inherited by the progeny of infected plants. Psyllid nymphs have occasionally been found on potato in Alberta, but *P. cockerelli* has not been recorded with certainty from the Province.

SCHREAD (J. C.) & GARMAN (P.). **Some Effects of Refrigeration on the Biology of *Trichogramma* in artificial Breeding.**—*J. N. Y. ent. Soc.* **42** no. 3 pp. 263–283. New York, September 1934.

An account is given of comparative experiments in rearing the yellow race of *Trichogramma* (*pretiosum*, Riley), which predominates in Connecticut, and strains of the dark race (*T. minutum*, Riley), chiefly obtained from other States or from Canada [*cf. R.A.E.*, A **22** 361], in the eggs of *Sitotroga cerealella*, Ol. Some of the information has been noticed from another source [**22** 315]. With 2 days' development before refrigeration and with 8 days of refrigeration at 37°F., the mortalities of the two races were respectively 12 and 45 per cent.; after a pre-refrigeration period of 3 days, the percentages were 34 and 32, and after 4 days 22 and 34. After pre-refrigeration periods of 5 days for *pretiosum* and 3 for *minutum*, 40 days in the refrigerator resulted in 84 and 90 per cent. mortality respectively. After 4 days' pre-refrigeration

and 40 days' refrigeration, 77 and 50 per cent., respectively, died. At 40°F., less than 10 per cent. of the parasites survived for more than 2 months. When they were kept for one week at 44°F. after 4 days' development the normal percentage (96) emerged, but after 40 days only about 34 per cent. emerged, and after 60 days all were dead. After developing for 3 days and remaining for one week at 47°F., 97 per cent. of *pretiosum* and 92 per cent. of *minutum* emerged, but after 40 days of refrigeration the percentages were 48 and 10 respectively. When the pre-refrigeration period was varied, the percentage of survival remained proportionately the same for the two forms. After one month at 49°F., 85, 96 and 73 per cent. respectively, of *T. pretiosum* emerged after 4, 3 and 2 days' pre-refrigeration. For one week of refrigeration, the percentages were 92, 91 and 94.

Comparison with the results obtained by refrigerating parasitised eggs of the Oriental fruit moth [*Cydia molesta*, Busck] shows that mortality is greater with short exposures than in eggs of *Sitotroga*, and that at the same temperature the survival of *pretiosum* is greater in the eggs of *Sitotroga* than in those of *Cydia*, while the reverse is the case for *minutum*.

De Leon (D.). **The Morphology of** *Coeloides dendroctoni* **Cushman (Hymenoptera : Braconidae).**—*J. N. Y. ent. Soc.* **42** no. 3 pp. 297–317, 3 pls., 28 refs. New York, September 1934.

Descriptions are given of all stages of *Coeloides dendroctoni*, Cushm. [*R.A.E.*, A **19** 579] and of the anatomy of the fully grown larva. A list shows the distribution of the seven species of this genus that occur in the United States, together with their hosts where known. *C. dendroctoni* has been recorded from Montana, Washington and Oregon, its hosts being *Dendroctonus monticolae*, Hopk., *Ips oregoni*, Eichh., *I. emarginatus*, Lec., *I. vancouveri*, Sw., and *I.* (*Orthotomicus*) *caelatus*, Eichh. A table shows variations in the position of the spiracles and arrangement of the tracheae in larvae of various species of Braconids, and a key to the subfamilies, based on these characters, is given.

Doner (M. H.). **Observations on the Biology of** *Microbracon pygmaeus* **(Prov.), an important Parasite of** *Coleophora pruniella* **Cl.**—*Ann. ent. Soc. Amer.* **27** no. 3 pp. 435–442, 6 refs. Columbus, Ohio, September 1934.

An account is given of observations on the bionomics of *Microbracon pygmaeus*, Prov., parasitising *Coleophora pruniella*, Clem., made during 1931–33 in Wisconsin, where this moth is a serious pest of apple and cherry, together with records of the distribution and hosts of the Braconid, all of which are species of *Coleophora*, in Canada and the United States. The habits observed were similar to those already recorded [*R.A.E.*, A **21** 515], except that as many as six eggs were deposited on one larva of *Coleophora* in the laboratory when only a limited number of hosts were available, although under normal conditions only one egg was placed on each mature larva. One female laid a total of 106 eggs in 16 days. The adults fed on the fluids of the host larva through punctures made in its case by the ovipositor. The eggs hatched in 36–38 hours [*cf. loc. cit.*], and the larvae passed through 4 instars and matured in 6–10 days. The adults first appear in the

field about the end of May, pair after a few days, and begin to oviposit. There is only one generation of *C. pruniella* a year, and by the time the adults of the new generation of the parasite appeared, most of the host larvae had pupated. As, however, the prepupal stage of *Coleophora* is readily parasitised, a second generation occurs, and in early July parasitism was quite heavy. During the late summer feeding season, the host larvae are too small to afford the parasites enough food for complete development ; no cases of parasitism were observed at this time, although an occasional female was found in the orchards between 17th August and 12th September. How the parasite overwinters is not known.

The degree of parasitism varies in parts of Wisconsin from 1 to 92 per cent., the percentage being highest when the infestation is lightest. The author considers that the chief limiting factor is the relative scarcity of late summer and overwintering hosts. In an orchard kept under observation, there was a heavy infestation by *C. pruniella* in 1930, with 14–20 per cent. parasitism. In 1931 infestation was lighter and parasitism was estimated at 39·8 per cent. By 1932 the larvae were very rare, and of those collected 31 per cent. were parasitised. Of the 32 parasites reared from *C. pruniella* collected in several orchards, this Braconid was the most abundant, being obtained from 70·4 per cent. of the parasitised larvae. From 6th June to 8th July its prevalence declined, owing to the increase of other parasites, including *Pimpla* (*Itoplectis*) *conquisitor*, Say, *Habrocytus* spp., *Eurydinota lividicorpus*, Gir., and *Cirrospilus flavicinctus*, Westw. *Hemiteles tenellus*, Say, was observed both as a primary parasite and as a hyperparasite attacking *M. pygmaeus*, but the extent of hyperparasitism was not determined.

Knowlton (G. F.). **Beet Leafhopper Notes.**—*Proc. Utah Acad. Sci.* **11** pp. 237–239, 1 fig. Provo, Utah, 1934.

An account is given of the spring dispersal of *Eutettix tenella*, Baker (beet leafhopper) in Utah during 1932–34. An adult female of *Nabis roseipennis*, Reut., found feeding on an Aphid on birch killed six adults and three nymphs of the leafhopper in an hour when confined with them in a glass vessel. In addition to natural enemies already noticed [*R.A.E.*, A **20** 470 ; **21** 101 ; **22** 88], the Lygaeids, *Geocoris atricolor*, Montd., and *G. pallens*, Stål, prey on the leafhoppers in Utah.

Knowlton (G. F.). **Potato Psyllid Investigations.**—*Proc. Utah Acad. Sci.* **11** pp. 261–265, 7 refs. Provo, Utah, 1934.

Further investigations in Utah on the potato Psyllid, *Paratrioza cockerelli*, Šulc [*R.A.E.*, A **19** 556] showed that there are five well defined nymphal instars. In experiments on its predacious enemies [*cf.* **22** 66], adults of *Nabis ferus*, L. [*cf.* **21** 650] confined with adults or nymphs of *P. cockerelli* killed several of them in about two hours. They also killed Aphids when these were confined with the Psyllid, and one of them fed for a time on the potato leaf. They appeared to find the active adult Psyllids more difficult to catch than they do the beet leaf-hopper, *Eutettix* (*Opsius*) *tenella*, Baker [*cf.* **20** 470]. In another experiment, a Syrphid larva killed five adults of *P. cockerelli* in a few hours.

The distribution of the Psyllid in Utah during 1932–33 is recorded.

Davis (J. J.). **Progress in Codling Moth Research.**—*Hoosier Hort.* **16** no. 9 pp. 131–135. Lafayette, Ind., September 1934.

A brief account is given of recent work on the codling moth [*Cydia pomonella*, L.] in Indiana. In one screened packing house measuring 72 by 72 ft. in which electrocutor light-traps were placed on each of the three floors in 1934, 232,662 moths were caught at the lights by 27th July, and it is estimated that over 150,000 more had been prevented from escaping by the screening. A stiff paste made by adding lime to a heated mixture of alpha naphthylamine with parawax (1 : 1) or used crank case oil (1 : 2) may be employed to fill in the cracks, split branches, cavities, etc., on apple trees where the larvae might pupate. In several heavily infested orchards, the amount of injured fruit was reduced by 17 per cent. where débris had been burnt early in 1934.

Crosby (C. R.), Rankin (W. H.) & Mills (W. D.). **Diseases and Insects of Small Fruits.**—*Cornell Ext. Bull.* no. 306, 28 pp. Ithaca, N.Y., N. Y. St. Coll. Agric., September 1934.

Brief notes are given on the diseases and insects attacking raspberries, blackberries, strawberries, currants, gooseberries and grape vines in New York State, including recommendations for their control.

Hatch (M. H.). **Insects in Gardens.**—*Little Gardens* **4** no. 1 pp. 3–5 ; & [? no. 2 extract] 2 pp. Seattle, Wash., March [? & April] 1933. [Recd. October 1934.]

This is a popular account of insects liable to occur in gardens in Washington State and of the measures employed for their control. In connection with the biological control of *Forficula auricularia*, L. [*cf. R.A.E.*, A **22** 652, etc.], it is recorded that *Pterostichus vulgaris*, L., an accidentally introduced European Carabid, has been spreading in Washington at least since 1927 and is stated by T. Kincaid to be of considerable value in keeping down the numbers of the earwig.

Watson (J. R.) & others. **Entomology.**—*Rep. Florida agric. Exp. Sta. 1932–33* pp. 75–80. Gainesville, Fla. [1934.]

Some of the pests observed in Florida during 1932–33 have been noticed from previous reports [*R.A.E.*, A **20** 647 ; **21** 410]. *Frankliniella insularis*, Frankl. (West Indian flower thrips), which had previously been recorded only from the extreme south of the State, has spread in a northerly direction and was found in one case on *Gladiolus*. *Taeniothrips gladioli*, Moult. & Stnw., did not breed rapidly on *Gladiolus* until well into the middle of March, and was only present during the summer in very small numbers, owing to heavy rains. The average longevity of the adults in March and April was 13 days, maximum 30 ; the average length of the nymphal stage was 12–14 days in March, 8–11 days in April, and 7–9 days in May. The egg stage varied from 2 to 3 days. The red-banded thrips [*Selenothrips rubrocinctus*, Giard.] caused dwarfing and russeting of guavas.

The establishment and increase of the Coccinellid, *Leis dimidiata*, F., ab. *quinquedecimspilota*, Hope, in one specific region only, where it has been found to give good control of *Aphis spiraecola*, Patch, on *Citrus*, was found to be connected with the summer food of the beetles, which feed mainly on the honey given off by the extra-floral nectaries

of *Crotalaria striata*, other sources of nourishment being pollen of various plants, sap and gum issuing from wounds on *Citrus* trees, and very tender oak shoots. The fungus, *Empusa fresenii*, controlled *A. spiraecola* in several groves in April 1933. This Aphid was also observed on quince and *Photinia serrulata*.

It was found that any spray strong enough to kill the larger plant bugs, such as *Nezara viridula*, L., that attack *Citrus* and vegetable crops is unsafe to apply to plants. Large numbers of *N. viridula* parasitised by *Trichopoda pennipes*, F., were killed by frost early in the autumn, with the result that the number of parasites surviving the winter was greatly reduced.

Life-history studies have been made of *Utetheisa bella*, L., which is a serious pest of *Crotalaria* grown for seed. The young larvae feed on the leaves and the older ones mine in the pods. They are commonly parasitised by Tachinids and *Empusa* sp. Preliminary work in the control of the cigar case bearer [*Coleophora caryaefoliella*, Clem.] on pecan indicated that a strong dormant spray will penetrate the hibernacula and kill the larvae ; after use for 3 successive years it has had no apparent injurious results upon the trees.

Davis (J. J.). **Insects of Indiana for 1933.**—*Proc. Ind. Acad. Sci.* **43** (1933) pp. 195–201. Indianapolis, Ind., April 1934.

Brief notes are given on a considerable number of insect pests recorded in Indiana in 1933. In addition to some of the species noticed from the preceding year's report [*R.A.E.*, A **21** 651], they include : *Sitodiplosis* (*Thecodiplosis*) *mosellana*, Géh., in threshed wheat ; *Ligyrus gibbosus*, DeG., damaging sunflower grown for seed ; *Melittia satyriniformis*, Hb., on cucurbits ; *Ancylis comptana*, Froelich, on strawberry ; *Anisota senatoria*, S. & A., defoliating oaks ; *Hyphantria cunea*, Drury, on shrubs and trees, including unsprayed apple ; *Alsophila pometaria*, Harr., which was very destructive to apple, plum, etc. ; *Lopidea davisi*, Knight, on *Phlox* ; and *Epargyreus tityrus*, F., on *Wistaria*.

Fleming (W. E.) & Baker (F. E.). **The Use of Naphthalene against the Japanese Beetle.**—*Tech. Bull. U.S. Dep. Agric.* no. 427, 28 pp., 55 refs. Washington, D.C., August 1934.

The following is taken from the author's summary of experiments in the United States on the value of naphthalene as an insecticide and repellent against *Popillia japonica*, Newm. Methods of determining naphthalene quantitatively are described. The physiological action of the vapour on the immature stages of the beetle is not clearly understood. Eggs and larvae exposed to it become reddish in colour (the latter being paralysed) and finally die. The order of resistance to the vapour was pupa, egg and larva. The time required to produce 100 per cent. mortality of the larvae in an atmosphere saturated with naphthalene varied with the temperature, ranging from 12 hours at 80°F. to 120 hours at 50°F. The time also decreased as the relative humidity was raised. The larvae may be destroyed in moist (not wet) potting soil free from large lumps, by applying naphthalene crystals at the rate of 5 lb. per cu. yd. if the temperature is above 50°F. and if the soil is left undisturbed for a week. The naphthalene decomposed rapidly in the soil under natural conditions and disappeared within 14 days. Decomposition was accelerated by the presence of peat in the soil. Potted plants have been grown successfully in previously treated soil. It was,

however, impossible to apply sufficient naphthalene crystals to the soil of potted hydrangeas to destroy larvae without injuring the plants. In a naphthalene-saturated atmosphere, the vapour penetrated soil in pots or soil-balls slowly. The best penetration was obtained by vapourising the crystals over hot water in an atmosphere of 90–95 per cent. relative humidity, but the plants were unable to withstand the length of exposure that was lethal to the larvae. The vapour did not protect either roses or ripening fruit from attack by the adults. Oviposition was prevented in the insectary by mixing naphthalene crystals with the soil at the rate of 1,000 lb. per acre, but the females still burrowed in the soil. The periodic application of naphthalene to the soil round the roots of annual plants during the flight of the adults reduced the larval population, but not sufficiently to be of economic value. The use of naphthalene is limited to treatment of soil before planting [*cf. R.A.E.*, A **22** 571, etc.] and is of little value as a repellent against the adult.

CARTWRIGHT (O. L.). **The Southern Corn Stalk Borer in South Carolina.** *Bull. S.C. agric. Exp. Sta.* no. 294, 32 pp., 10 figs., 3 graphs, 15 refs. Clemson Coll., S.C., February 1934. [Recd. October 1934.]

An account is given of the bionomics of *Diatraea crambidoides*, Grote, which occurs throughout South Carolina and in 1931 caused a loss of 15 per cent. in the yield of maize [*cf. R.A.E.*, A **22** 70]. Its systematic position, distribution in the United States, and history and importance in South Carolina are discussed, all stages are described, and the types of injury caused by it and by other pests are compared.

In life-history studies, the technique of which is described, egg-laying occurred at night, and the oviposition period for 283 individuals averaged 5·24 days with a maximum of 13. The eggs were found in clusters of 1–67 (average 3·6) on all parts of the plant in the field, and on well grown maize they were most numerous on leaves 12–36 inches from the ground. The average number of eggs laid by one female was 306·2 among 369 caged individuals, the normal production probably being 375–400 [**19** 313]. The incubation period was 4 days at 87°F. and 8 at 70°, most of the eggs hatching during the day. The larval period varied from 22 days to nearly a year, the average for larvae that did not overwinter being 32 days. In cooler parts of the State many of the larvae from eggs laid in May did not pupate until the following spring, but in the east and south there are two and a partial third generations a year, the larvae appearing about mid-May, in the first half of July and at the end of August. In late September and October the larvae are usually found in tunnels extending into the tap root, and at the lowest point they overwinter. As many as 4 or 5 may hibernate successfully in one stalk, but usually there are only 2; the larvae destroyed each other in the rearing cages. Pupation takes place in a silk-lined tunnel leading to the exterior, which is closed by a thin layer of tissue; the exit hole is usually situated 1–2 inches above the ground. The pupal period was 25 days at 67°F. and 7 or 8 at 85°. There were about equal numbers of males and females; the average length of their life was about a week.

Among the natural enemies recorded [*cf.* **19** 313] are the larvae of *Chauliognathus marginatus*, F., *Scarites substriatus*, Hald., and

Monocrepidius sp., which preyed on the larvae; and three larval parasites, *Microbracon caulicola*, Gah., *Cremastus graciliventris*, Cushm., and the Nematode, *Diplogaster aerivora*, Cobb.

Control is best effected by cultural measures [*cf.* **19** 313]. Methods of ploughing and suitable dates for planting in various parts of the State are discussed.

NETTLES (W. C.). **The Codling Moth in South Carolina.**—*Bull. S.C. agric. Exp. Sta.* no. 295, 30 pp., 7 figs., 5 refs. Clemson Coll., S.C., May 1934. [Recd. October 1934.]

An account is given of the bionomics and control of the codling moth [*Cydia pomonella*, L.] on apple in South Carolina. Three and a partial fourth brood occur in the year [*R.A.E.*, A **19** 313], the first two causing serious damage, while the third, though not generally regarded as destructive, may undo the control secured over the first two. The stages, seasonal history and development of the moth, and the extent of the damage it causes in the State are described. Various methods of control are discussed, and a spray schedule is given. In tests, 70 per cent. of the apples sprayed were undamaged when fish oil (1 qt. to 50 gals. spray) was added to sprays of lead arsenate (1 lb. to 50 U.S. gals. Bordeaux mixture) applied after 1st June, but only 47 per cent. when no fish oil was added. Of substitutes for lead arsenate tried, only summer oil (2 per cent.), which was considerably more expensive, gave better results. The cost of spraying is discussed in detail. Three-ply burlap bands tested under adverse conditions were only about 11 per cent. efficient in collecting larvae. Cultivation in early spring is recommended, since no pupae were found to emerge from under 1 inch of soil, and few larvae can emerge from under 3 inches.

The egg-parasite, *Trichogramma minutum*, Riley, is more important in nature than *Ascogaster carpocapsae*, Vier., which parasitises the larvae. In one orchard, a natural parasitism of 19·3 per cent. of the first brood eggs was raised to 62·4 per cent. by release of *T. minutum* at the rate of 1,000 individuals per tree. Over 80 per cent. of the second and third brood eggs were parasitised, but in spite of this 75 per cent. of the apples were infested. No spray was applied in this orchard.

Entomological and Zoological Investigations.—*Rep. S. Carolina Exp. Sta.* **46** (1932–33) pp. 69–93, 2 graphs. Clemson Coll., S.C., December 1933. [Recd. October 1934.]

O. L. Cartwright records observations on several pests of maize in South Carolina in 1932–33. Field infestation by *Diatraea crambidoides*, Grote, was 26–82·5 per cent. of the stalks in the autumn of 1932, but the winter mortality was high, the infestation in the same fields in March being 2–42 per cent. Adults of *Sphenophorus* (*Calendra*) *callosus*, Ol., which appears to be more destructive than *S.* (*C.*) *maidis*, Chitt. [*R.A.E.*, A **18** 216], were seen in the field as early as 3rd April, and those of the new generation on 7th July. Second generation eggs were laid in the insectary on 8th July. Many adults hibernated through two winters (1931–33) and then oviposited. In rearing experiments the egg stage lasted 4–16 days, the larval 28–55, and the pupil 6-13. A small percentage of active females continued ovipositing after submergence in water for 6 days. The most serious damage occurred in

fields previously planted with maize. Work on *Calandra* (*Sitophilus*) *oryzae*, L., which is very injurious to both field and stored maize, showed that the incubation period was 5–6 days at 72–76°F., the four larval instars occupied an average of 30 days, and the pupal period was 5–12. In oviposition cages, the females laid an average of 102 eggs each on hard maize, the egg-laying period averaging 47·8 days. The numbers of the sexes were approximately equal. Collections on screens covered with an adhesive indicated that the beetles overwinter in woodland.

W. C. Nettles gives an account of the present status of parasite work in the control of the oriental fruit moth [*Cydia molesta*, Busck] on peaches. Large numbers of the European egg parasite, *Trichogramma euproctidis*, Gir., were reared and released. The serious increase of the moth during the spring of 1933 was greatly reduced by hot, dry weather during June. There was only a one per cent. infestation on an early variety of peach, but varieties ripening later than 20th August were severely infested. Of apples found infested by the codling moth [*Cydia pomonella*, L.] on examination at harvest, over 50 per cent. had been attacked by the third brood [see preceding paper].

J. G. Watts and O. L. Cartwright report a few cases of severe injury by various Thysanoptera in late spring to cotton and onions growing near lucerne, small grains and forage crops. *Thrips tabaci*, Lind., was responsible for 99 per cent. of the injury to onions ; there was noticeable difference in resistance among the varieties. *Taeniothrips gladioli*, Moult. & Stnw., which had not previously been recorded in South Carolina, was found on *Gladiolus*.

F. Sherman considers that the spread of the Mexican bean beetle [*Epilachna corrupta*, Muls.] has been hindered by several physical factors ; an average of 29·1 per cent. caged adults emerged from hibernation in 1933 [*cf.* **22** 71] .

Hartzell (A.) & Wilcoxon (F.). **Organic Thiocyanogen Compounds as Insecticides.**—*Contr. Boyce Thompson Inst.* **6** no. 3 pp. 269–277, 1 fig., 20 refs. Menasha, Wis., 1934.

The following is taken from the authors' summary : Preliminary studies are recorded on the toxicity of fifteen organic thiocyanogen compounds when used as sprays against *Aphis rumicis*, L., on nasturtium, the compounds including both aliphatic and aromatic compounds of various types. Several of them were markedly toxic at the concentration used (0·1 per cent.) and were much more so than the corresponding halogen compounds. Injury to the nasturtium plants occurred in several cases. From the point of view of effect on both insect and plant, the most satisfactory compound was γ-thiocyanopropyl phenyl ether, and this also gave excellent control of *Pseudococcus citri*, Risso, and *Tetranychus telarius*, L. Of 20 plants sprayed with this compound only buckwheat showed injury. When tested on *Periplaneta americana*, L., it showed indications of paralytic properties. Nerve lesions were noted in the larvae of *Tenebrio molitor*, L., that had been killed by the application of this compound externally, following a technique used in the detection of paralysis that involves the use of toluidine blue [*R.A.E.*, A **22** 451]. Death apparently resulted from injury to the central nervous system accompanied by paralysis.

McDunnough (J.). **The Canadian Species of the Tortricid Genus *Peronea*.**—*Canad. J. Res.* **11** no. 3 pp. 290–332, 8 pls. Ottawa, September 1934.

Descriptions are given of the adults, and particularly the genitalia of both sexes, of the 43 species of *Peronea* known to occur in Canada, 7 of them being new, with records of their distribution and food-plants where known.

Fenton (F. A.). **Tingitoidea affecting Cotton.**—*Canad. Ent.* **66** no. 9 pp. 198–199, 2 refs. Orillia, Ont., September 1934.

A Tingid, subsequently identified as *Gargaphia iridescens*, Champion, was observed in May 1933 to have caused reddish brown spots on cotton leaves in Texas. This insect has also been reported from Colorado, New Mexico and Mexico. Other Tingids that have been recorded on cotton are *Corythucha gossypii*, F., in the southern United States, Central America and the West Indies, *Corythaica costata*, Gibson, in Peru, *G. solani*, Heidemann, in Oklahoma, *G. torresi*, Costa Lima, in Argentina and Brazil, *G. subpilosa*, Berg, in Argentina, Bolivia and Brazil, and *Monanthia monotropidia*, Stål, in Brazil. *G. torresi* was recorded from Brazil by Bondar [*R.A.E.*, A **12** 413] as *G. bimaculata*, Parshley, which is not known to occur in South America.

Swaine (J. M.). **Three new Species of Scolytidae (Coleoptera).**—*Canad. Ent.* **66** no. 9 pp. 204–206. Orillia, Ont., September 1934.

The new species described are: *Xyleborus* (*Xyleborinus*) *tsugae* from *Tsuga heterophylla* in British Columbia; *X.* (*X.*) *libocedri* from *Libocedrus decurrens* in Oregon; and *Phloeosinus piceae* from *Picea canadensis* in Quebec.

Carter (W.). **Unsaturated Petroleum Oils as Insecticides**—*Science* **80** no. 2075 p. 315. New York, 5th October 1934.

This is a note on experiments in which Diesel fuel oils, at present used freely in Hawaii as weed-killers, were adapted for use as insecticides, their toxic effects on plants being practically nullified. The oils are emulsified on a colloidal clay carrier such as Bentonite, and are then diluted in the spray tank in such a manner that the hydration of the oil-charged Bentonite particles is greatly increased. This process is essentially one of acidifying the spray water before adding the concentrated emulsion. Field tests showed that a 1 per cent. dilution of a concentrated emulsion containing 50 per cent. Diesel oil is adequate for control of *Pseudococcus brevipes*, Ckll., on pineapple, and repeated sprays of 1–4 per cent. did not injure the plants. In preliminary experiments a 3 per cent. spray gave excellent control of *Coccus viridis*, Green, on *Citrus* with no harmful effects on the trees.

DeLong (D. M.). **Insecticidally induced Immunity in Plants to Sucking Insects.**—*Science* **80** no. 2075 pp. 320–321, 5 refs. New York, 5th October 1934.

A type of induced immunity in plants from attack by sucking insects, similar to that produced by Bordeaux mixture [*R.A.E.*, A **22** 417, etc.],

is also produced by various sulphur materials. It is suggested that they either greatly increase the quantity of some toxic material normally produced by the plant or cause a direct chemical change in the plant by a change in the sap and by affecting the general rate of metabolism.

TUCKER (R. W. E.). **Report on Entomological Section** [Dep. Sci. Agric. Barbados].—*Agric. J. Barbados* **3** no. 2 pp. 16–19. Barbados, April 1934.

Notes are given on the colonisation in 1933 of *Trichogramma* [*minutum*, Riley] for the control of *Diatraea saccharalis*, F., on sugar-cane in Barbados [*cf. R.A.E.*, A **22** 538, etc.].

In investigations on *Diaprepes abbreviatus*, L., carried out in Porto Rico, where it is a more serious pest of *Citrus* than sugar-cane, it was found that *Tetrastichus haitiensis*, Gah., parasitised its eggs on the former alone [but *cf.* **22** 115, 539]. This parasite was reared from consignments sent by air mail to Barbados and liberated, but it is unlikely that it will be useful against *D. abbreviatus* on sugar-cane there [*cf.* **20** 612].

Of Scoliid parasites of Lamellicorn larvae studied in Porto Rico in co-operation with W. F. Jepson [**22** 620], four species were brought to Barbados with a view to their employment against *Lachnosterna* (*Phytalus*) *smithi*, Arrow. Some of each species were liberated and others retained for rearing in the laboratory. *Elis haemorrhoidalis*, F., soon showed itself unsuited to the new host, and *Campsomeris trifasciata*, F., and *Campsomeris tricincta*, F. (*pyrura*, Roh.), failed to survive in the laboratory. *Elis eppippium*, F. (*xanthonotus*, Roh.), produced three generations on *L. smithi*, although 80 per cent. of the adults that emerged were males, but after this it showed signs of failing because of inability to emerge from the cocoon. It now remains to investigate the possibility of using against *L. smithi* the predacious Elaterid, *Pyrophorus luminosus*, Ill., some adults of which were sent to Barbados from Porto Rico and liberated. As, however, most of the adults collected are males, the best chance of establishing the beetle in Barbados seems to be in the introduction of larvae, which are known to be able to survive transport and to live in the laboratory for several months on the larvae of *L. smithi*. Hand collection of adults and cultural methods, however, remain the most reliable control both of *D. saccharalis* and of *L. smithi* in Barbados.

WILLE (J.). **Estudio entomológico de la Epidemia del Paludismo en los Valles de la Convención y Lares (Dept. del Cuzco).** [An entomological Study of the Epidemic of Malaria in the Convención and Lares Valleys in the Department of Cuzco.]—*Bol. Direcc. Agric. Ganad. Peru* **3** no. 11–12 pp. 303–322, 15 figs., 4 maps. Lima, 1933. [Recd. October 1934.]

This paper [*R.A.E.*, B **22** 259] also records some pests of plants, including *Diatraea saccharalis*, F., *Metamasius hemipterus*, L., and *M. anceps*, Gyll., on sugar-cane; *Eriophyes gossypii*, Banks, and *Dysdercus ruficollis*, L., on cotton; *Eloria noyesi*, Schaus, on coca [*Erythroxylon coca*]: *Pseudococcus citri*, Risso, *Selenaspidus articulatus*, Morg., and *Lepidopsaphes beckii*, Newm., on *Citrus*; and *Acromyrmex hispidus*, Santschi, which is a general pest in these Peruvian valleys.

Salmón de los Heros (A.). **Tres insectos peligrosos para la fruticultura y jardinería : el *Diaspis pentagona*, el *Icerya purchasi* y los coccidos del género *Orthezia*.** [Three Insects dangerous to Fruit-growing and Gardening : *Aulacaspis pentagona*, *I. purchasi* and Coccids of the Genus *Orthezia*.]—*Bol. Direcc. Agric. Ganad. Peru* **3** no. 11–12 pp. 467–481. Lima, 1933. [Recd. October 1934.]

This paper gives information on the biology and control of *Aulacaspis* (*Diaspis*) *pentagona*, Targ., occurring mainly on peach, *Icerya purchasi*, Mask., infesting *Citrus*, and *Orthezia insignis*, Dougl., which attacks ornamental plants and occasionally spreads from them to *Citrus*. *A. pentagona* and *I. purchasi* were only introduced into Peru a few years ago.

Dash (J. S.). **Entomological Investigations.**—*Adm. Rep. Dep. Agric. Brit. Guiana 1932* pp. 29–30 ; *1933* pp. 25–26. Georgetown, Demerara, 1933–34.

There was a serious outbreak of the white stem-borer, *Scirpophaga albinella*, Cram., on rice in British Guiana in 1932, and of *Dyscinetus bidentatus*, Burm., on sugar-cane both in 1932 and 1933, hand collection being still the only control measure of any value for the latter. Severe injury was caused by *Sipha flava*, Forbes (yellow sugar-cane aphis) in different parts of the Colony during the wet seasons. Nicotine sulphate sprays were used with fair success in some cases. The Lycaenid, *Tmolus echion*, L., appeared on pineapple in some plantations, but only a few fruits were injured. Another pest of this crop was the Coreid, *Athaumastus laetus*, Mayr.

Marchionatto (J. B.) & Vallega (J.). **Ensayos a campo del " hongo verde " (*Sporotrichum paranense* March.) de la langosta voladora.** [Field Experiments with the " Green Fungus " of the Adult Locust.]—*Bol. Minist. Agric. Argent.* **35** (1933) no. 1–3 pp. 69–77, 6 figs., 2 graphs. Buenos Aires, 1934.

In Argentina, 65–100 per cent. mortality of hoppers of *Schistocerca paranensis*, Burm, was obtained by watering them, on plots surrounded by iron sheets, with a suspension of the spores of *Sporotrichum paranense* [*R.A.E.*, A **22** 351]. The full effect was not visible until after five days. The infestation spreads by contact with the spore culture, which can be very easily obtained in the laboratory.

Lahille (F.). **La langosta y las campañas langosticidas.** [The Locust and Anti-locust Campaigns.]—*Bol. Minist. Agric. Argent.* **35** (1933) no. 1–3 pp. 115–119, 3 fldg diagrs. Buenos Aires, 1934.

A decimal system for the co-ordination of data concerning *Schistocerca paranensis*, Burm., and its control in Argentina is described.

Economic Advisory Council. **Committee on Locust Control. Sixth Report. Review of the present Locust Outbreak in Africa and western Asia and of the Investigations carried out since 1929, and a Note on the general Programme of further Investigations.**—55 pp. London, H.M.S.O., Cmd. 4692. August 1934. Price 1s.

A brief review is given of the present outbreaks of *Schistocerca gregaria*, Forsk., in Africa and western Asia, and of *Locusta migratoria migratorioides*, Rch. & Frm., and *Nomadacris septemfasciata*, Serv., in Africa,

from their beginnings in or after 1926 to 1933. The outbreaks of the first two species have been gradually diminishing, though the situation regarding *Schistocerca* in north-west Africa continues to be serious. On the other hand, the outbreak of *Nomadacris* is developing rapidly, and the outlook with regard to it is most menacing.

The second section of the report deals with the locust investigation organised on the recommendations of the Economic Advisory Council by the Imperial Institute of Entomology, as well as of those organised by the Governments of Nigeria, the Union of South Africa, India, France, Italy, Belgium and Egypt. In the third section, a general programme of further investigations is discussed. The fourth is devoted to the question of controlling flying locusts by clouds of finely divided sodium arsenite discharged from aeroplanes. The preliminary laboratory experiments carried out with this end in view are described in detail.

In the fifth section, an account is given of the international co-operation in anti-locust research, and the sixth and seventh comprise a summary of the scientific results so far achieved.

An appendix gives some information with regard to the fungus, *Empusa grylli*, which in 1934 caused epidemics among *Nomadacris* in South Africa [*cf. R.A.E.*, A **22** 593], Northern and Southern Rhodesia, and Nyasaland. The available evidence suggests that the outbreaks of the disease have been somewhat local and cannot be expected to produce a serious reduction in the total number of the swarms.

Uvarov (B. P.). **The Locust Outbreak in Africa and Western Asia in 1933.**—*Econ. adv. Coun. Comm. Locust Contr.* 66 pp., 9 maps. London, H.M.S.O., 63–80–3, 1934. Price 2*s*.

In continuation of the survey of 1932 [*R.A.E.*, A **22** 45], the breeding and migrations in 1933 of *Schistocerca gregaria*, Forsk., *Locusta migratoria migratorioides*, Rch. & Frm., and *Nomadacris septemfasciata*, Serv., are discussed in detail and illustrated by a series of maps.

The situation with regard to *Schistocerca* in the Moroccan-Senegambian and the Algerian-Nigerian areas did not show any considerable improvement. Only a few scattered swarms had been present in the eastern half of Africa. During the latter part of the winter of 1933–34, however, exceptionally heavy rains fell on the African Red Sea coast, there was a rapid increase in the number of solitary locusts, and incipient swarming occurred in at least one place on the coast of the Sudan. While there is no immediate danger at present, a strict watch on that area is necessary. The situation in India was similar, in that there were no swarms, but an increase in the numbers of solitary locusts was noticed and a renewed invasion is possible. Additional data were obtained in 1933 with regard to the life-cycle of the swarming phase. Owing to the very abnormal weather conditions of the year, the behaviour of swarms was also partly abnormal.

The general situation with regard to *Locusta* began to improve in 1932 and continued in 1933, but more slowly than was expected. The infested area remained practically the same as before ; a slight decrease in Eritrea and Somaliland was counterbalanced by an extension to Nyasaland, Portuguese East Africa, Southern Rhodesia, the Transvaal

and Natal. The intensity of the outbreak was definitely on the decrease during 1933, particularly in Kenya and Tanganyika. The further outlook is considered very hopeful.

The pessimistic forecasts with regard to *Nomadacris* made in the previous survey were fully justified by the developments during 1933. The infested area expanded in all directions, but particularly to the south. A considerable part of the Union of South Africa was invaded, while further to the north the infestation extended from the coast of Portuguese East Africa to the Atlantic coast of Angola. In the north, Uganda was reached by swarms. A still greater extension of the invaded area can be anticipated both in the south and in the north. North of the equator, a second annual generation may be expected, increasing the gravity of the situation still further. The 1934 data on the migrations of this species suggest they are not always so regular as they were in the preceding years ; further study is required to elucidate this question, which is more complicated than appeared at first.

An appendix contains a bibliography of papers dealing with the locust and grasshopper problem, continuing and supplementing the lists published in the previous surveys.

PASQUIER (R.). **Contribution à l'étude du Criquet marocain,** *Dociostaurus maroccanus* **Thnb., en Afrique mineure. (1re Note.)**— *Bull. Soc. Hist. nat. Afr. N.* **25** no. 6 pp. 167–200, 4 pls., 8 figs., 33 refs. Algiers, June 1934.

Field investigations in 1933 revealed the presence of the solitary phase of *Dociostaurus maroccanus*, Thnb., in several distinct natural zones of Algeria. In most of the habitats studied, the hoppers occurred singly, without any tendency to congregate ; it was only on the slopes of the practically bare hills near Boghari that definite concentrations of hoppers were found in the small depressions overgrown by fresh *Hordeum murinum*, *Spergularia rubra* and *Plantago albicans*. These congregating hoppers differed considerably in coloration from the solitary ones. The adults evolving from solitary hoppers were studied biometrically and compared with gregarious ones from swarms ; the elytron-femur ratio was found to be 1·48 and 1·8 in the solitary and gregarious locusts respectively. These observations, however, were not confirmed by results obtained from breeding experiments, probably because the latter were made in a locality with a climate differing from that of the normal area of the species.

In a study of the distribution of the locust, the author distinguishes, under the name " gregarigenous regions," areas in which there occurs from time to time a sequence of ecological conditions that induces a transformation of the solitary phase into the gregarious one. Several such regions found in Algeria are shown on a map. The climate and vegetation of one of them (Boghari) are described in detail, but no definite conclusions can yet be drawn as to the meteorological factors determining outbreaks. It appears possible that the initial increase in the population of solitary individuals may be very gradual and extend over a period of years.

A plan is proposed for organising a regular periodic survey of suspected areas in order to discover incipient congregations and prevent the further development of outbreaks.

Zolotarevsky (B. N.), de Lepiney (J.) & Dupont (L.). **Note préliminaire sur *Schistocerca gregaria* Forsk. dans le Soudan Français Oriental.**—*Bull. Soc. Hist. nat. Afr. N.* **25** no. 6 pp. 206–213. Algiers, June 1934.

The investigations on the distribution of the solitary phase of *Schistocerca gregaria*, Forsk., in the French Sudan [*R.A.E.*, A **22** 327] have been extended into the north-eastern parts of the Colony. Solitary individuals were found in a number of stations between 17 and 19°N. Lat., in a zone of contact between the climate and vegetation of Southern Sahara and the Sahel. The habitats of the solitary phase usually represent small isolated areas with somewhat better vegetation in a region remaining arid during all or most of the year. Under such conditions, there is a single generation a year, produced during the rainy season, but it is possible that a supplementary generation is sometimes completed during the rains.

Zolotarevsky (B. N.). **Invasions des Acridiens en Guinée Française.**—*Bull. Soc. Hist. nat. Afr. N.* **25** no. 6 pp. 214–231, 3 maps. Algiers, June 1934.

An analysis of available data on the invasion of French Guinea by *Locusta migratoria migratorioides*, Rch. & Frm., showed that the first swarms appeared at the end of 1928 in the west, coming from the French Sudan. Later, some swarms entered from Sierra Leone, but these were secondary, arising outside the latter Colony. On penetrating into French Guinea, the locusts reproduce, and the swarms of the next generation return northwards, though they may stop for egg-laying in the north of the Colony, where invading swarms from Senegal and French Sudan may also breed. The north of French Guinea with the adjoining parts of French Sudan and Senegal should be specially watched, and it is there that control measures aiming at the protection of the more southern parts of French Guinea should be concentrated.

The seasonal movements of swarms appear to follow very closely the movements of humidity belts [*cf. R.A.E.*, A **20** 97]. The direction of flight and of the prevailing wind were found to coincide, but the influence of wind is considered to be secondary.

Records are given of the previous locust invasions in French Guinea (in 1907, 1919, 1924 and 1925), but the species involved are doubtful, some of the reports probably referring to *Schistocera gregaria*, Forsk., or *Anacridium moestum*, Serv. Individuals of *Schistocerca* were found in swarms of *Locusta* in March 1934 as far south as the Kindia district of French Guinea.

Recommendations for the usual control methods are appended.

Morstatt (H.). **Die Bekämpfung der Heuschreckenplagen.** [Measures against Locust Outbreaks.]—*Tropenpflanzer* **37** no. 10 pp. 413–419. Berlin, October 1934.

This is a brief review of the various measures now employed against locusts.

Proceedings of the Third International Locust Conference, London, September 18, 1934.—184 pp., 2 maps, 4 pls. London, H.M.S.O., Cmd. 4725, 1934. Price 3*s.* 6*d.*

At this Conference the Governments represented were those of Afghanistan, the Union of South Africa, Belgium, Great Britain and Northern Ireland, Egypt, Spain, Abyssinia, France, India, Italy, Liberia, Portugal, and the Anglo-Egyptian Sudan.

The following are brief summaries of the papers read and of the resolutions associated with them. The resolutions are printed in both English and French.

In Zolotarevsky (B. N.) Aires grégarigènes et facteurs de transformation de la phase solitaire des acridiens migrateurs dans la phase grégaire (pp. 62–66), the relation between the distribution area of the phase *solitaria* of a locust species and the outbreak centres is discussed. The primary factors in producing the transformation of ph. *solitaria* into ph. *gregaria* are the initial increase in numbers of the *solitaria* individuals over large areas, followed by their crowding together within a restricted space, which is brought about by the similarity of their reactions to external, mainly microclimatic, conditions. Hence the outbreak centres must occur in areas characterised by fluctuating climatic conditions, such as are found within a zone of contact between two climatic regions. In species normally inhabiting small areas with stable conditions, the transformation may be brought about by the accumulation of individuals alone. To elucidate the transformation process further, the exact rôle of accumulation and the effect of humidity must be investigated.

In Resolution 1 (*a*), pp. 28–29, it was agreed that the main object of international anti-locust research must be the delimitation of the outbreak areas, in which the primary swarms make their appearance. To attain this, thorough field and laboratory studies should be made of the factors determining transformation of ph. *solitaria* into ph. *gregaria* for each species or geographical subspecies ; among ecological factors special attention should be paid to microclimate, the food as determining the habitat, associations with other organisms, and accumulations of individuals of the same species.

In Ramchandra Rao (Y.) The Life-Cycle, particularly Sexual Maturation, in Relation to climatic and other Factors and Methods of Study (pp. 67–73), laboratory and field observations in India on the life-cycle of *Schistocerca gregaria*, Forsk., are described. The duration of various stages is determined mainly by temperature and humidity. There is no obligatory diapause in the adult stage, sexual maturation being entirely dependent on environmental conditions ; thus in cages with suitable humidity and at a constant temperature of 37–39°C. [98·6–102·2°F.], six successive generations were obtained in a year. In Resolution 1 (*b*), pp. 30–32, it was agreed that the study of the life-cycle in locusts is of great practical importance, since it can change under the direct influence of climatic factors, and incipient swarming may occur as the result of its acceleration. The central problem in the life-cycle is the presence or absence of the diapause in the adult stage, which determines the duration of the life-cycle in the tropical locusts. Special attention should be paid to the effect of climatic factors, and the initial data collected in the field should form the basis of subsequent exact laboratory work.

In Michelmore (A. P. G.) Migration and the Factors inducing it with Regard to all Phases, and Methods of their Study, with special Reference to the Type of meteorological Maps likely to be of Assistance (pp. 73–77), it is stated that migrations, in all stages, are caused by the instinct of individuals to move with the others, their behaviour depending primarily on the degree of crowding, and not on the phase. Once started, migration is controlled by a number of limiting and guiding factors that appear to vary in different regions. The seasonal variations in the intensity of migration, usually ascribed to differences in the degree of maturity, can in most cases be explained by the degree of crowding and climatic factors. The influence of the latter is discussed ; the effect of humidity is probably indirect, the direction of migration within the limits set by temperature, humidity and other factors being governed by some unknown factor that varies with the humidity. There is some correlation between wind and the direction of flight.

In Resolution 1 (*c*), pp. 32–34, it was agreed that in order to build up an effective forecasting system, migrations should be correlated with meteorological data. The recording of swarms should be made a routine at meteorological stations, and supplementary stations should be established where required. The desired meteorological data are enumerated, and the need of attaching a meteorologist to locust research organisations is stressed.

In Golding (F. D.) Methods of Field Surveys in Locust Research (pp. 77–82), the author discusses the methods of intensive and extensive field surveys, of estimating the population, and of vegetation studies, and emphasises the need to standardise methods in order to obtain comparative data. Field work should be supplemented by climatic and microclimatic observations ; the latter are best obtained by means of self-recording instruments. In Resolution 1 (*f*), pp. 36–38, it was agreed that the choice of methods must be left to the field worker, but that uniformity is very desirable. Suggestions are made on the best ways of studying locust populations and of analysing plant communities, and on meteorological methods and studies of microclimates.

In Johnston (H. B.) The Ecology and Habits of Locusts in an Invasion Area (Uganda), with special Reference to *Locusta migratoria migratorioides* (Reiche & Fairmaire) ph. *transiens* (pp. 82–92), observations on behaviour and habitats of *transiens* individuals of *Locusta migratoria migratorioides*, Rch. & Frm., made in Uganda with a view to elucidating the factors determining the passage from ph. *gregaria* to ph. *dissocians*, are discussed. The size of a hopper band can be drastically reduced and yet give rise to phase *gregaria* adults provided that a certain amount of activity is preserved during the larval stage. When activity is reduced, as for instance in the *Cynodon* short grass habitat, with a plentiful supply of food, the resulting adults are *dissocians*. The reduction in the size of bands is brought about mainly by successive ovipositions by the parent swarm leading to scattered deposition of egg-pods, and by reduction in numbers of eggs laid, delayed incubation and egg parasites and diseases.

In Resolution 1 (*d*), pp. 34–36, it was agreed that the study of dissociating factors is likely to throw light on the conditions characterising the outbreak centres, and that special attention should be paid to ph. *gregaria* in the invasion areas during the decline of an outbreak and to the choice by swarms of egg-laying sites.

In Hopkins (J. C. F.) Locust Diseases (pp. 92–93), the need of ecological investigations on the fungus, *Empusa grylli*, is stressed, and various lines along which research should be attempted are suggested. In Resolution 1 (*e*), p. 36, it was agreed that a combined field and laboratory study should be made on the fungus, to determine the part it plays in the swarm cycles and its use for control, such study to be undertaken in the southern half of Africa. Cultures of fungus and bacterial parasites of locusts should in future be deposited in recognised centres of fungus and bacterial research.

In Uvarov (B. P.) Fundamental Research on the Locust Problem (pp. 93–96), the author stated that although all aspects of the locust problem must be studied for its thorough understanding, fundamental research should, in the first instance, be concentrated on questions arising out of field work. A number of such problems concerned with the physiology and activity of both phases are discussed, and the need for providing financial assistance to research laboratories undertaking these studies is suggested. In Resolution 1 (*g*), p. 40, the above suggestions were accepted, and the list of the problems approved by the Conference.

In King (H. H.) The Destruction of Locusts in Flight by Means of a Poison Dust (Sodium Arsenite), delivered from Aircraft (pp. 97–125, 4 plates), an account is given of experiments on dusting flying swarms of locusts [*Nomadacris septemfasciata*, Serv.] from a special discharge apparatus fitted to a " Hercules " aeroplane, which were carried out by the author in Northern and Southern Rhodesia in May–June 1934. This is supplemented by notes by Messrs. W. Allen and J. K. Chorley who acted as ground observers.

In Naudé (T. J.) The Use of Aeroplanes in Locust Control (pp. 125–127), are recorded experiments on dusting hoppers and resting swarms of *Nomadacris* from a de Haviland 9 aeroplane made in the Union of South Africa in March 1934. With the aeroplane flying at a height of 80–100 ft. and applying 10 lb. sodium arsenite dust per acre, heavy mortality was obtained within 48 hours.

In Resolution 1 (*i*), p. 42, it was agreed that the foregoing experiments showed that locusts in flight do not avoid the cloud of arsenite dust and are not disturbed by the aircraft ; a large percentage of those passing through a dust cloud fall to the ground and die. The cloud must be discharged as close as possible to the front of the swarm ; under normal conditions it remains sufficiently dense to be toxic for not less than three minutes. To avoid damage to livestock and crops, sodium arsenite must be uniform in fineness, and the swarm flying not less than 100 ft. above the ground. Valuable results may also be obtained by the use of aircraft for dusting resting swarms. Further experiments with a view to developing the foregoing methods are highly desirable.

In Resolution 1 (*h*), pp. 40–42, it was agreed that research is also required to show the reasons for variability in the efficiency of poison baits as well as on the exact toxic action of arsenic, and on the possibility of finding substitutes for arsenical compounds.

In respect of Further Investigations on the Desert Locust, *Schistocerca gregaria* (Forskål) ; Draft Programme submitted by the United Kingdom Delegation (pp. 127–129), the Conference agreed, in Resolutions 2 (*b*), p. 44, and 3 (*a*) (ii), p. 48, that the problem of this locust is further from solution than that of others, owing to the difficulties accompanying the study of the outbreak centres, and

stressed the need of surveys to be undertaken in the suspected areas in Africa and Western Asia. These are enumerated, and their study allocated to the respective Governments.

In Michelmore (A. P. G.) Summary of Results and Programme of further Investigations on the Red Locust, *Nomadacris septemfasciata* (Serville) (pp. 130–132), notes are given on work concerned mainly with factors affecting migrations, and with outbreak areas and centres. The distribution of solitary individuals is limited by the presence of bushes or trees, permanent flooding and absence of grass more than one and a half feet high. In Resolutions 2 (*c*), pp. 44–46, and 3 (*a*) (iii), pp. 48–50, the Conference recommended the preparation of maps showing the distribution of grasslands in African territories south of the Sahara, to facilitate the delimitation of outbreak areas and centres ; a study of isolated locusts during the later stages of an outbreak ; and the carrying out of laboratory work in the southern half of Africa. The areas in which reconnaissance and investigations should be carried out are enumerated, and their study allocated to the respective Governments.

In respect of Silvestri (F.) Research carried out under the Auspices of the Italian Government on *Dociostaurus maroccanus* (Thunberg) and on *Calliptamus italicus* (Linn.) (pp. 132–133), in Resolution 2 (*d*), p. 46, the Conference agreed that biological studies on *D. maroccanus* should be carried out in all the countries suffering from this species.

No resolution was passed in respect of Faure (J. C.) The Organisation for the Collection of Information on Locusts in the Union of South Africa (pp. 133–134).

In Ramchandra Rao (Y.) Summary of Locust Research Work carried on in North-west India under the Auspices of the Imperial Council of Agricultural Research, Simla (pp. 134–139), and Husain (A.) Summary of the Work done on the Desert Locust, *Schistocerca gregaria* (Forskål), at Lyallpur during the Years 1931 to 1933 (pp. 139–142), studies are recorded of various anatomical and bionomic problems, such as the influence of external factors on pairing, oviposition, incubation, hatching, coloration of hoppers, and length of adult stage ; the effect and choice of food were specially investigated. Extensive surveys were made in parts of Baluchistan, Sind, Punjab and Rajputana, and non-gregarious individuals were discovered in isolated localities of the desert region. These can undertake limited migrations from one type of habitat to another, somewhat like the migratory phase. The observations on the solitary locusts are described, and the " reks " of the Baluchistan coast are considered to be the outbreak areas [*R.A.E.*, A **22** 121].

In Faure (J. C.) A brief Summary of Investigations on Locust Problems in the Union of South Africa (pp. 143–144), are included observations on egg-laying and on the effect of extreme temperatures and humidities on incubation in *Nomadacris septemfasciata*. Attempts to produce a second generation in incubators were unsuccessful. When hoppers were bred against painted backgrounds, good resemblances to black, white and yellow were obtained. *Wohlfahrtia euvittata*, Villen., two species of *Sarcophaga* and a species of *Blaesoxipha* were bred from the adults. Some breeding experiments were carried out on *Locustana pardalina*, Wlk. During the minimum years, this species occurs mainly in the Karroo areas, the outbreak centres in which are characterised by open spaces, well-drained soil and short vegetation. It

increased with amazing rapidity in 1933–34, probably owing to exceptionally heavy and wide-spread rains.

In Faure (J. C.) The Occurrence of the Tropical Migratory Locust, *Locusta migratoria migratorioides* (Reiche & Fairmaire), in the Union of South Africa in 1933–1934 and in South West Africa in 1931–34 (pp. 145–147), it is suggested, in discussing the 1932 invasion of the Union of South Africa, that extreme mutual stimulation to activity obtained in dense swarms, repeated through successive generations, leads to excessively long migrations, which may produce physical exhaustion resulting in inability to reach sexual maturity. Such "mad migrations" support the idea that phase *gregaria* is an expression of a semi-pathological condition, and phase *solitaria* is the normal state of the species.

In Faure (J. C.) The Swarming of *Schistocerca gregaria* (Forskål) in the Union of South Africa and in South West Africa in 1934 (pp. 147–152), it is stated that incipient swarms of *Schistocerca gregaria*, Forsk., probably representing the second generation since the beginning of breeding up, occurred in April–May 1934 in a number of districts in South West Africa and in western Cape Province. In some parts of the Warmbad district of South West Africa up to 50 per cent. of the young adults were parasitised by *Wohlfahrtia euvittata*. A description of the habitat in which numerous *transiens* individuals were found, in the dry bed of the river Molopo, is included.

In Déclarations et voeux soumis par la Délégation belge (pp. 152–153), an account is given of the organisation for collecting information on locusts in the Belgian Congo, and the need for studies of local species of ACRIDIDAE, which occasionally migrate, is stressed. In Resolution 3 (*a*) (iv), p. 50, it was agreed that there is a need for such investigations.

In Jack (R. W.) Locusts in Southern Rhodesia (pp. 154–163), a short account is given of the invasions since 1909 of Southern Rhodesia by *Nomadacris septemfasciata*, *Locusta migratoria migratorioides* and *Locustana pardalina*. During the last outbreak control was carried out mainly by spraying with sodium arsenite. The results of the campaigns and the capacity of *Nomadacris* for damage in Southern Rhodesia are discussed; as a rule the hoppers feed on graminaceous crops, but adults attack other plants as well. *Stomatorrhina lunata*, F., proved an important egg parasite. The locust fungus, *Empusa grylli*, caused an epidemic among *Locustana* in 1924–25, and among *Nomadacris* in 1933–34.

In Mistikawi (A. M.) Locust Research in Egypt (pp. 163–168), are given data most of which have already been noticed [**21** 400].

In Zolotarevsky (B. N.) Rapport préliminaire sur l'action de la Mission d'Etudes de la Biologie des Acridiens en 1932–1934 (pp. 169–179, 1 map), work carried out mainly in the French Sudan is discussed. The conditions in which ph. *solitaria* of *L. m. migratorioides* exists in different habitats are described. The extensive floods of the Niger in 1924 and 1925, during which the inundation spread into the neighbouring Sahel region and thus created new favourable breeding areas, followed by the crowding of the locusts owing to the less extensive floods in 1926 and subsequent restriction of the habitable area, are considered as the probable causes of the transformation of the local *solitaria* population into ph. *gregaria*, which led to the appearance of swarms by 1928. The probable location of the outbreak area is on the margins of the inundation zone of the river Niger, between Ké-Macina

and Lake Debo. Data on *Schistocerca gregaria* have been reviewed elsewhere [**22** 327, 703]. There is urgent need to survey the areas to the north and north-east of Lake Chad.

In Resolutions 2 (*a*), p. 44, and 3 (*a*) (i), p. 46, the Conference agreed that the region of the middle Niger is the only known outbreak area of *L. m. migratorioides*, and as such is of international interest. The investigations there have reached the stage of systematic field research at specified points.

In Déclarations et voeux soumis par la Délégation française (pp. 181–184), the work so far carried out and that projected for the future, under the auspices of the Comité d'Etudes de la Biologie des Acridiens of Algiers are dealt with. Various suggestions concerning further international research on locusts are made; these are incorporated in the respective resolutions.

Resolutions 3 (*b*), (*c*), (*d*) and (*e*), pp. 50–58, deal with improvements on the present system of reporting on locusts, arrangements for the exchange of reports between field investigators, definition of terms relating to the distribution and migration of locusts, and standardisation of biometric methods.

Finally the Conference agreed (p. 58) that the locust problem is essentially the same in all parts of the world, and that all countries suffering from locusts should be invited to attend the Fourth Conference to be held at Cairo in 1936.

MEYRICK (E.). **Exotic Microlepidoptera, iv, pt. 17.**—pp. 513–544. Marlborough, Wilts, the author, October 1934. Price 3*s.* per pt.

Among the new species described is the Pyralid, *Dichocrocis* (*Conogethes*) *crocodora*, bred from larvae rolling leaves of coffee in the Belgian Congo.

AUCHINLECK (G.). **Experimental Work.**—*Rep. Dep. Agric. Gold Cst 1933–34* pp. 10–12. Accra, 1934.

Work on pests of stored cacao in the Gold Coast during 1933 is briefly discussed [*cf. R.A.E.*, A **22** 618]. A poison bait of 4 gals. expressed sugar-cane syrup, 1 gal. water and $\frac{1}{4}$ oz. sodium arsenite was effective against fruit-piercing moths attacking *Citrus* [*cf. R.A.E.*, A **21** 278], an average of 132 moths being captured in each bait during the outbreak in April. Grapefruit suffered most severely in the area investigated, because one of its two fruiting periods is in April, when almost all the oranges have been picked. The yield in that month was decreased by about 90 per cent. Injury to fruit for local consumption may be reduced by picking it 2 or 3 weeks before maturity and ripening it in store.

PERROT (E.). **Le dattier dans les oasis des Zibans et de l'Oued Rhir (Biskra-Touggourt).**—*Not. Cent. Docum. tech. écon. Pl. méd.* no. 41, 70 pp., 8 pls., many refs. Paris, March 1934.

In this report on the cultivation of date palms in the Algerian Sahara, brief reference is made (p. 40) to their infestation by *Paratetranychus heteronychus*, Ewing, and *Parlatoria blanchardi*, Targ. [*cf. R.A.E.*, A **20** 267; **21** 34; etc.] The Coccid had probably been imported from Mesopotamia with a consignment of dates. Only

young palms seem to be seriously affected by it, and it has been checked by means of its predacious enemies, *Pharoscymnus anchorago*, Fairm., and *Cybocephalus seminulum*, Baudi [*cf.* **14** 457]. Among many measures tested against it, only fumigation with hydrocyanic acid gas has shown promise.

KRUGER (G.). **Frammenti di entomologia cirenaica.** [Fragments of Cyrenaican Entomology.]—*Agric. colon.* **28** no. 9 pp. 460–463. Florence, September 1934.

Some of the information given here has already been noticed [*R.A.E.*, A **21** 671]. *Gelechia* (*Bryotropha*) *plebeiella*, Zell., is so serious a pest of tomatos in Cyrenaica that their export is permitted only from December to mid-March. Experiments are being made with baits that are suitable for the very dry climate. Baits have proved effective in almost completely eradicating the larvae of *Euxoa segetum*, Schiff., *Agrotis* (*E.*) *ypsilon*, Hfn., *Calocampa* (*Xylina*) *exoleta*, L., *Laphygma exigua*, Hb., and *Nomophila noctuella*, Schiff., which a few years previously destroyed vegetables and lucerne. Scale-insects are kept down by natural enemies, Coccinellids being the chief check on *Aspidiotus hederae*, Vall. *Rodolia* (*Novius*) *cardinalis*, Muls., is imported annually against the few infestations of *Icerya purchasei*, Mask. There is continuous supervision of the suspected breeding-places of *Dociostaurus maroccanus*, Thnbg., and *Schistocerca gregaria*, Forsk.

PRIESNER H.) & HOSNY (M.). **Contributions to a Knowledge of White Flies (Aleurodidae) of Egypt (II).**—*Bull. Minist. Agric. Egypt* no. 139, 21 pp., 15 pls. Cairo, 1934.

In continuation of previous work on the Aleurodids of Egypt [*R.A.E.*, A **20** 620], descriptions are given of the pupa cases of *Dialeurodes kirkaldyi*, Kotinsky, on various ornamental plants, *Aleurocanthus zizyphi*, sp. n., on *Zizyphus spina-christi* ; *Aleuroplatus cadabae*, sp. n., on *Cadaba rotundifolia*, and *Bemisia longispina*, sp. n., on guava, and of the adult female of *Aleurocanthus zizyphi*. The usual food-plant of *D. kirkaldyi* in Egypt is *Jasminum sambac* ; it occurs on the lower surface of the leaves, and an oil emulsion has been recommended for its control. It has also been found on *Jasminum* in Syria.

Union of South Africa. Proclamation No. 48 of 1934.—*Un. S. Afr. Govt. Gaz.* no. 2180 p. 753. Pretoria, 23rd March 1934. [Recd. October 1934.]

The following are declared pests under the Orchard Cleansing Act [*R.A.E.*, A **13** 389] : *Aspidiotus perniciosus*, Comst., *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., *Chrysomphalus ficus*, Ashm., *Lepidosaphes pinnaeformis*, Bch., *Coccus* (*Lecanium*) *hesperidum*, L., *Ceratitis* (*Pterandrus*) *rosa*, Ksh., *Tetranychus telarius*, L., *Bryobia praetiosa* Koch (*pratensis*, Garm.), *Eriosoma lanigerum*, Hsm., and *Pseudococcus* spp.

Union of South Africa. Agricultural Pests Amendment Act, 1934.—No. 15, 1934. 3 pp. [Pretoria] 1934.

This Act, which amends the Agricultural Pests Act of 1911 (No. 11), enforces the registration of all nurseries and regulates the sale of

nursery stock in the Union of South Africa ; provides for the prohibition or restriction of the introduction into or movement in the Union of any plant, insect or germ of any plant disease ; and requires occupiers of land to notify the presence of flying locusts or hoppers or the deposition of locust eggs.

SHIRAKI (T.). **Insect Pests of Citrus-trees in Formosa. i & ii.**—*J. Soc. trop. Agric.* **6** nos. 1–2 pp. 29–36, 187–194. Taiwan, March–June 1934.

Notes are given on the biology, feeding habits and, in some cases, the control of 102 species of insects injurious to *Citrus* in Formosa. They include *Brachytrypes portentosus*, Licht., *Termes* (*Odontotermes*) *formosanus*, Shir., the Aphids, *Toxoptera aurantii*, Boy., *Aphis citricidus*, Kirk., *A. odinae*, v. d. G., and *A. gossypii*, Glov., the Aleurodids, *Dialeurodes citri*, R. & H., *Aleurocanthus spiniferus*, Quaint., and *Bemisia giffardi*, Kotinsky, the Psyllid, *Diaphorina citri*, Kuw., the Flatid, *Geisha distinctissima*, Walker, the Jassid, *Idiocerus niveosparsus*, Leth., the Cicadids, *Platypleura kaempferi*, F., and *Rihana ochracea*, Wlk., the Tineid, *Phyllocnistis citrella*, Stn., the Tortricids, *Homona coffearia menciana*, Wlk., and *Adoxophyes privatana*, Wlk., the Psychid, *Clania* (*Cryptothelea*) *formosicola*, Strand, and 30 species of Coccids. The natural enemies of these last known in Formosa are *Schizobremia formosana*, Felt, parasitic on *Pseudococcus filamentosus*, Ckll., *Microterys* sp. on *Pulvinaria psidii*, Mask., *Aneristus ceroplastae*, How., on *P. polygonota*, Ckll., and *Aphytis* (*Aphelinus*) *chrysomphali*, Merc., and *Coccophagus hawaiiensis*, Timb., on *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.).

[ALEKSANDROV (A. I.).] **Александров (А. И.). A Note on the Larva of *Callipogon relictus* Sem. (Coleoptera, Cerambycidae).** [*In Russian.*]—*Ann. Club Sci. Geogr. Y.M.C.A.* **1** (1933) pp. 156–159, 1 pl. Harbin, 1934.

Brief notes are given on the measurements and movements of the larva of the Prionid, *Callipogon relictus*, Sem., which bores in the wood of *Quercus mongolica*, *Fraxinus manshurica* and *F. rhynchophyla* in Manchuria.

SUMMERVILLE (W. A. T.). **Queensland Citrus Scale Insects and their Control.**—*Qd agric. J.* **41** pts. 5–6 pp. 450–486, 568–591 ; **42** pts. 1–2 pp. 4–33, 186–207, 13 pls., 16 refs. Brisbane, May–August 1934. Also as *Bull. Div. Ent. Dep. Agric. Qd* no. 10, 101 pp., 13 pls., 16 refs. Brisbane, August 1934.

This important paper is based on the results of three years' study of the Coccids attacking *Citrus* in Queensland, which comprise the following species : *Aonidiella aurantii*, Mask. ; *Chrysomphalus ficus*, Ashm. ; *Lepidosaphes beckii*, Newm. ; *Prontaspis* (*Chionaspis*) *citri*, Comst. ; *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.) ; *S. oleae*, Bern. ; *Coccus hesperidum*, L. ; *C. longulus*, Dougl. ; *Paralecanium expansum*, Green ; *Pulvinaria cellulosa*, Green ; *Ceroplastes rubens*, Mask. ; *C. destructor*, Newst. [*cf. R.A.E.*, A **20** 601] ; *Pseudococcus adonidum*, L. (*longispinus*, Targ.) ; and *Icerya purchasi*, Mask.

The following is largely taken from the author's summary : Two of these species, *Pulvinaria cellulosa* and *Paralecanium expansum*, which are known to occur elsewhere only in Ceylon, have not previously been found on *Citrus* in Queensland, where the latter had been recorded only on *Ficus macrophylla*. The economic status of the group and of each species is discussed, together with the factors affecting their incidence. Records are made of the seasonal life-history and habits of the important species, and of their chief natural enemies. It is only considered advisable to make further introductions against *Ceroplastes rubens*. The various chemical measures available are discussed, and the results are given of experiments on the control of the individual species. A spray of 10 lb. resin, 3 lb. sodium hydroxide, 1½ lb. fish oil (preferably herring oil) and 40 gals.water, which, unlike the ordinary oil sprays, can safely be applied within a month of Bordeaux mixture, but should not be applied within 3 months of an oil, gave results not much inferior to fumigation with hydrocyanic acid gas. The concentrate is prepared with 2 gals. boiling water, the ingredients being added in the order given. Special attention is devoted to the application of oil emulsions. The use of highly refined white oil reduces the danger of injury to the trees. It is not advisable to use red oil in general spraying, or any oil where the trees are dormant or are suffering from lack of water. The results are given of investigations, mostly carried out in commercial orchards, on combined sprays and on double spraying, and recommendations are made for the treatment of *Citrus* in various districts and of trees affected by various associated pests and by fungi. A subject index is appended.

Mungomery (R. W.). **The Control of Insect Pests of Sugar Cane.**—*Qd agric. J.* **42** pt. 2 pp. 222–229. Brisbane, August 1934.

The fundamental principles of insect control, including cultural, chemical, biological and legislative methods, are reviewed with particular reference to their possible application against pests of sugar-cane in Queensland.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **45** pt. 9 pp. 513–518, 8 figs. Sydney, 1st September 1934.

These notes, which belong to a series on insect pests in New South Wales [*cf. R.A.E.*, A **22** 658], deal with the cockroaches, *Periplaneta americana*, L., and *Blattella germanica*, L. ; *Phalaenoides glycinae*, McLeay, on grape-vines ; *Choroicetes terminifera*, Wlk. [*cf.* **22** 477, etc.] ; and *Lyctus brunneus*, Steph., and *Anobium punctatum*, DeG. [**16** 630, etc.] in seasoned timber, pinhole borers of the genus *Xyleborus* and *Platypus* that infest unseasoned timber being briefly referred to.

Robertson (W. C.). **Arsenate of Lead.—Analysis of Samples.**—*J. Dep. Agric. Vict.* **32** pt. 9 pp. 450–453, 4 figs. Melbourne, September 1934.

Methods of preparing lead arsenate to be used as an insecticide are briefly described, and the specifications for a satisfactory product are given, together with the results of analysis of 14 proprietary brands and of tests of the time that several remain in suspension.

Trotter (A.). **Il fungo-Ambrosia delle gallerie di un Xyleborino di Ceylon.** [The Ambrosia Fungus of the Mines of a Xyleborine of Ceylon.]—*Ann. Ist. sup. agr. Portici* (3) **6** pp. 256–275, 6 figs. many refs. Portici, 1934.

Ambrosiaemyces zeylanicus, gen et sp. n., is described from the mines of a Xyleborine Scolytid in branches of *Brownea grandiceps* imported from Ceylon into Italy.

Ramakrishna Ayyar (T. V.). **First Record of the Chalcid Genus *Comperiella* Howard from India with a Description of a new Species.**—*Rec. Indian Mus.* **36** pt. 2 pp. 219–221, 1 fig., 3 refs. Calcutta, June 1934.

Comperiella indica, sp. n., is described from adults of both sexes reared at Coimbatore from *Aspidiotus tamarindi*, Green, which is often a serious pest of tamarind. A key is given to the females of the species of *Comperiella*.

Muesebeck (C. F. W.). **Seven new Species of Indian Bethylidae (Hymenoptera).**—*Rec. Indian Mus.* **36** pt. 2 pp. 223–232, 2 figs. Calcutta, June 1934.

Among the new species described is *Perisierola nephantidis*, a parasite of *Nephantis serinopa*, Meyr. This is thought to be the species of which the bionomics were described under the name *Parasierola* sp. [*R.A.E.*, A **17** 113]. A key to the Indo-Australian species of *Perisierola* is included.

Bounhiol (J. J.). **Les vols de courtilières. Que savons-nous de leur déterminisme ?**—*Rev. Zool. agric.* **33** nos. 5–7 pp. 65–75, 81–85, 97–108, 1 map, 29 refs. Bordeaux, May–July 1934.

In April–May 1933, large numbers of *Gryllotalpa gryllotalpa*, L., emerged from the ground in various localities over a considerable area in the neighbourhood of Bordeaux and flew in swarms for distances of about 1,000 yards. The females had never previously been known to fly, and the males only rarely. From a study of the conditions under which the flights occurred, the author considers that such factors as temperature and humidity are inadequate to account completely for them, and suggests that they may possibly have been due to some influence associated with solar radiation. He compares the apparent correlation that has been observed between the periodicity of outbreaks of various Orthoptera, including locusts, and that of sun-spots [*cf.* *R.A.E.*, A **21** 50 ; **22** 563, etc.].

Feytaud (J.). **A propos de l'emploi du phosphure de zinc contre les courtilières.**—*Rev. Zool. agric.* **33** no. 7 pp. 108–110. Bordeaux, July 1934.

The wording of French legislation dealing with the use of zinc phosphide in poison baits for the control of *Gryllotalpa gryllotalpa*, L. [*R.A.E.*, A **22** 511] appeared to suggest that the use of such baits is permitted only when authorised by the local syndicates for the protection of cultivated plants, and that baits containing zinc phosphide

must not be sold to private individuals. An enquiry, however, has elicited the statement that the use of zinc phosphide baits is open to anyone without restriction.

André (M.). **Un Acarien (Oribate) prédateur de** *Platygaster*.—*Bull. Mus. nat. Hist. nat.* (2) **6** no. 4 pp. 348–352, 22 refs. Paris, June 1934.

In pupae of *Mayetiola* (*Phytophaga*) *destructor*, Say, parasitised by *Platygaster zosine*, Wlk., collected from the stubble of wheat at Versailles in February 1934, the Oribatid mite, *Scheloribates laevigatus*, Koch, was found attacking adults of *Platygaster* in their cocoons, causing a mortality of 60 per cent. After the stubble had been a month in the laboratory, the mortality rose to 90–95 per cent. This mite is of common occurrence in moss and humus and had previously been regarded as phytophagous. This is generally true of Oribatids, but in addition to the present instance, a list of observations, beginning as early as 1855 and collected here by the author, show that some Oribatids are able to become predacious on insects.

Jacquet (—). **Présentation de** *Sphaericus gibbioïdes* **Boïeld., trouvé à Bron (Rhône).**—*Bull. Soc. linn. Lyon* N.S. **3** no. 9 p. 141. Lyons, November 1934.

The Ptinid *Sphaericus gibboides*, Boield., is recorded from near Lyons, in a box of dried camomile flowers of unknown origin. These had been enclosed in the box for several years and had been reduced to dust.

Pussard (R.). **A propos du capnode** (*Capnodis tenebrionis* **L.) redoubtable ravageur des arbres fruitiers.**—*Éclair. agric. hort* 1934 reprint 7 pp. Nice, 1st September 1934.

A brief description of the stages of *Capnodis tenebrionis*, L., is given, together with the results of observations made at Antibes of the damage caused by it to fruit trees, especially peach and apricot. Notes are given on the distribution of this Buprestid in France, and various possible methods of control are discussed [see next paper].

Balachowsky (A.). **Le Bupreste du pêcher** (*Capnodis tenebrionis* **L.).** *Rev. Zool. agric.* **33** no. 8 pp. 113–125, 2 pls., 14 refs. Bordeaux, August 1934.

The life-history of *Capnodis tenebrionis*, L., many details of which remain to be elucidated, is reviewed from the literature, together with methods by which control has hitherto been attempted [*R.A.E.*, A **19** 625 ; **21** 313, etc.]. This Buprestid, which is common throughout the Mediterranean region, is primarily a pest of plum in Algeria, apricot in Morocco, peach in the central part of southern France, almond and apricot in Alpes-Maritimes, and cherry in the Caucasus and Crimea. In Italy and Palestine all varieties of stone-fruit trees appear to suffer equally. Breeding also occurs in wild rosaceous plants, particularly wild cherry, hawthorn [*Crataegus*] and wild plum. The adults first appear about the beginning of May, and become most numerous in July and August. They feed on the young shoots of the different fruit trees, stripping away the bark, and destroying the leaves and buds. The eggs

are laid in the bark of the trunk, generally at the collar or on the upper roots just below the soil. Most of the larvae are found near the root collar, where they enter the wood and mine downwards below soil level. They develop in lateral tunnels made beneath the bark, preferably of young trees 2–5 years old, healthy trees being as susceptible to attack as weak or sickly ones. Natural enemies appear to be almost completely absent, but a fungous disease of the pupae has been observed in Alpes-Maritimes. No adults emerged from infected pupae, which dried up.

[Feytaud (J.).] **Les Ephippigères en Médoc.**—*Rev. Zool. agric.* **33** no. 8 pp. 125–126. Bordeaux, August 1934.

A severe outbreak of *Ephippiger ephippiger*, Fieb., was reported in July 1934 from several vineyards in Médoc. Although common in the Mediterranean region, such outbreaks are rare in the Gironde, the Tettigonids attacking vines only when deprived of their normal food-plants [*cf. R.A.E.*, A **19** 156]. The adults eat the grapes and the branches as well as the foliage. Control measures include hand-collection, and if the trouble is discovered early enough, the green parts of the vine may be sprayed with nicotine or an arsenical [*cf.* **16** 344].

Trouvelot (B.), Raucourt (M.) & Castets (J.). **Remarques sur le mode d'action physiologique des principes actifs de** *Solanum tuberosum* **envers les larves de** *Leptinotarsa decemlineata*.—*C. R. Acad. Sci. Fr.* **199** no. 15 pp. 684–686, 1 ref. Paris, 1934.

A study in France of the principles in the leaves of potato attractive to larvae of *Leptinotarsa decemlineata*, Say [*R.A.E.*, A **22** 47] was continued in order to investigate the effect of concentrated extracts of these constituents on the behaviour of the insects. It was found that the higher the concentration of the alcoholic extract containing the active principles of the leaves, the greater the amount of elder pith soaked in the extract that the larvae consumed. They attacked more or less indiscriminately all the pieces of soaked pith near them, but the lower the alcoholic concentration, the sooner they ceased feeding and began to wander again. The largest number occurred on the pieces with the highest extract concentration. Alcoholic extracts from leaves chlorotic through lack of water or light were less attractive.

André (M.). **Notes sur les acariens observés dans les magasins régionaux de tabacs.**—*Ann. Epiphyt.* **19** no. 6 pp. 331–356, 19 figs. Paris, 1934.

The author discusses the occurrence in insufficiently dried tobacco in France of Glycyphagid and Tyroglyphid mites that feed on moulds, and Cheyletids that are predacious on them. In this connection he reproduces the text and illustrations of a manuscript by M. Hardy dated 1867, containing descriptions of a number of mites found in tobacco in Strasbourg, and attempts to decide the identity of the species recorded.

Paillot (A.). **Un Cerambycide parasite des noyers** (*Oberea linearis*, **L.).**—*Ann. Epiphyt.* **19** no. 6 pp. 369–379, 7 figs., 11 refs. Paris, 1934.

Oberea linearis, L., the synonymy, distribution and morphology of which are briefly discussed, has recently caused serious injury to walnut

and hazel [*Corylus*] in Drôme and Hautes-Alpes. On infested branches of walnut sent from these places, the first adults, all of which were males, appeared in breeding cages in 1933 at the beginning of May. The date of emergence in various parts of Europe varies according to the climate. In Denmark, J. C. Nielsen (1903) observed males on 20th July and females on 24th July, the latter becoming more numerous as the males died off soon after pairing. Pairing occurred in Denmark chiefly on the higher forks of the branches of hazel trees, and immediately afterwards the females began to lay eggs singly between the bark and the wood of young green shoots through a hole made by ovipositor. After an incubation period of varying length, estimated at 14 days by Nielsen, the young larva begins to devour the surface wood of the hazel twig. Eckstein (1892) observed that it mines a circular tunnel, cutting off the circulation of the sap. This mine is continued to a point opposite the site of entry, and then towards the tip of the branch, penetrating both bark and wood. Later the larva retraces its course downwards, boring deeply into the heart of the wood. The mine on hazel trees is generally extended almost to the ground. Infested branches turn black, and the terminal portion is weakened and easily broken off by the wind. On walnut, the bark of the young twig is slightly raised from the wood when the egg is laid, and the author's observations show that the young larva, after devouring the wood near the surface, makes an oblique tunnel into the centre of the branch and proceeds through the pith towards the tip. It then turns back and by the beginning of winter has arrived again at the base of the young shoot. During the winter the larva remains stationary in the medullary gallery, and resumes its downward course in the spring, attacking second-year wood, but making little progress. It reaches its maximum size in the spring of the third year and rests in a niche formed in the gallery. On infested walnut branches sent from Hautes-Alpes, the first pupae were observed on 15th April and the pupal stage lasted about 3 weeks. Observations show that on walnut in France a large proportion of the eggs fail to hatch and that there is a considerable mortality among the young larvae before they have even begun to mine. The older larvae are sometimes destroyed by predators, including a Clerid, *Opilo pallidus*, Ol., the stages of which are briefly described, and by the Ichneumonids, *Ephialtes heteropus*, Thoms., and *Phaenolobus arator*, Rossi, which pupate in the mine of the host, the adults emerging during the first half of June.

Since it would be extremely difficult to capture the adults of this Lamiid, as the period of flight is fairly long, the only method of control likely to be successful is to cut off and burn the infested shoots of walnut in autumn before the leaves fall. In Drôme this control would not be efficient without the destruction of the wild hazel trees that grow near the walnut groves and are usually more heavily infested than walnut.

Şuster (P. M.). **Contribution à l'étude de la Faune Tachinidologique de Roumanie.**—*Ann. sci. Univ. Jassy* **18** pp. 479–511, 39 refs. Jassy, October 1933. [Recd. October 1934.]

This is a further list [*R.A.E.*, A **19** 21] of 12 Tachinids and 35 Calliphorids occurring in Rumania, with morphological and biological notes on each and the name of the host when known.

[Vukasović (H.) & Vukasović (P.).] Voukassovitch (H.) & Voukassovitch (P.). **Variations dans la durée du développement du papillon** *Ephestia kuehniella* **Zeller.**—*C. R. Soc. Biol.* **117** no. 28 pp. 33–36. Paris, 1934.

Experiments in Jugoslavia showed that the development to the adult stage of larvae of *Ephestia kühniella*, Zell., may require five times as long a period on the poorest food as on the richest. Larvae hatched about the same time from eggs of the same female and reared separately in test tubes on the same food and under the same conditions fell into two categories, which in the first experiment comprised 92 and 8 per cent., respectively, and in the second 77 and 23 per cent. In the first experiment, the former developed to adults in 45–59 days and the latter in 68–136. In the second, the corresponding periods were 72–84 and 91–192 days. In both categories, the resulting adults included healthy and well developed males and females. The authors believe that these differences must be attributed to internal causes. The individual variations were most marked when the larvae were reared on poor food. Thus between two individuals of a small group reared on rice flour there was a difference of 287 days, and most of the individuals in the group only produced a single generation in the year. The results obtained from rearing larvae on richer foods, such as maize flour, were contradictory, probably because the effects of the nutritive medium were opposed by internal variations. Further, individual variations were greater when the larvae were reared in groups, and the extent of the variations increased with the size of the groups. These extensive individual variations, which aid the species by distributing the appearance of adults, make it misleading to speak of a definite number of generations in the year.

Legislative and Administrative Measures. Spain.—*Int. Bull. Pl. Prot.* **8** no. 9 p. M 204. Rome, September 1934.

In view of the presence of the banana weevil, *Cosmopolites sordidus*, Germ., in Madeira, an order dated 28th May 1934 prohibits (except under permit) the introduction into the Canary Islands of all plants or parts of plants of the genus *Musa* from any place, and of all classes of living plants and products or residues of vegetable origin from Madeira.

To prevent the introduction of *Aspidiotus perniciosus*, Comst., the import into Spain of all kinds of fresh fruits, living plants or parts of living plants from Portugal, Argentina, Brazil, Mexico or South Africa is prohibited as from 16th August 1934.

Wahl (B.). **Austria : Knowledge acquired on the Subject of the San José Scale.**—*Int. Rev. Agric.* **25** no. 10 pp. M 217–M 220 ; also in *Int. Bull. Pl. Prot.* **8** no. 10 pp. 217–220. Rome, October 1934.

Investigations on the occurrence of *Aspidiotus perniciosus*, Comst., in Austria, where it was first observed in 1931 [*R.A.E.*, A **20** 506], have shown that it was probably introduced in 1927 or 1928, most of the infestations being in small gardens planted after that time with new fruit trees procured from other countries, particularly Hungary. It has been found on apples and gooseberries, and in one case on plums. No instance of natural spread has been observed, and the scale has not

increased so rapidly as had been expected, having apparently only two generations a year. It has been intercepted on apples from Jugoslavia and Rumania.

Schøyen (T. H.). **Melding om skadeinsektenes optreden i land- og havebruket i årene 1930–1933.** [Report on Insects injurious to Agriculture and Horticulture in 1930–1933.]—*Landbruksdirekt. Årsberetn. 1930–1933* pp. C 1–C 44, 26 figs. Oslo, 1934.

Pests recorded in Norway during 1930–33 and not mentioned in previous reports [*R.A.E.*, A **17** 251 ; **18** 693] include *Rhopalosiphum* (*Siphonaphis*) *prunifoliae*, Fitch (*padi*, auct.) on oats ; *Macrosiphum* (*Siphonophora*) *avenae*, F. (*cerealis*, Kalt.), on barley and grasses ; *Phorbia* (*Chortophila*) *genitalis*, Schnabl, on wheat ; *Trachea* (*Parastichtis*) *monoglypha*, Hfn., on grasses ; *Galeruca* (*Adimonia*) *tanaceti*, L., on grasses, crucifers and potatoes ; *Blitophaga* (*Silpha*) *opaca*, L., and *Anomala* (*Phyllopertha*) *horticola*, L., on potatoes ; *Aphis fabae*, Scop., on beet ; *B. opaca*, *Phyllotreta* (*Haltica*) *nemorum*, L., and *P.* (*H.*) *undulata*, Kutsch., on turnips ; *Acidia* (*Philophylla*) *heraclei*, L., on celery ; *Meligethes aeneus*, F., on cabbage ; and *Euxoa* (*Agrotis*) *segetum*, Schiff., on spinach.

Phorbia (*Chortophila*) *trichodactyla*, Rond., has recently become a serious pest of young bean plants. The eggs are laid in newly ploughed, moist soil, in rotting potatoes, roots of cabbage or clover, etc., and the larvae on hatching enter freshly planted beans just as they are sprouting, or may attack beet, cabbage, potatoes and other plants. Deeply planted beans with long underground stems suffer most severely. Pests of apple included *Anthonomus pomorum*, L., *Cheimatobia brumata*, L., *Argyresthia conjugella*, Zell., and *Lyonetia clerkella*, L., and in one locality in 1933 considerable damage was caused to the unripe fruits by *Curculio* (*Balaninus*) *nucum*, L. This weevil usually breeds in the nuts of hazel [*Corylus*], but these were not available owing to the destruction of the buds by frost in the preceding winter. The adults fed on the surface of the apples, causing numerous sunken brown spots, but it is probable that most of the eggs laid in them failed to hatch, as only a few small larvae were found in apples in July. Pears were attacked by *Taeniothrips inconsequens*, Uzel, *Psylla pyrisuga*, Först., *Lygus pratensis*, L., *L. pabulinus*, L., *Acanthosoma haemorrhoidale*, L., *Calocoris* (*Pycnopterna*) *striata*, L., *Pentatoma rufipes*, L., *Cantharis obscura*, L., and *Contarinia* (*Diplosis*) *pyrivora*, Riley. Plums were attacked by *Rhynchites cupreus*, L., *Hoplocampa fulvicornis*, Panz. (*minuta*, Christ), *Anthocoris nemorum*, L., *Paratetranychus pilosus*, C. & F., which also occurred on apple and pear, and *Eriophyes similis*, Nal. Pests of small fruits included *L. pabulinus*, *M. aeneus*, *Batophila* (*Glyptina*) *rubi*, Payk., *Anthonomus rubi*, Hbst., and *Tarsonemus fragariae*, Zimm., on strawberry, and *Bryobia praetiosa*, Koch (*ribis*, Thomas) on gooseberry.

Scheidter (F.). **Die Borkenkäfer der Kiefer. Ihre Erkennung und Bestimmung nach den Gangbildern und biologischen Merkmalen.** [Bark-beetles of Pines. Their Recognition and Identification by the Appearance of their Mines and biological Characters.]—*Flugbl. biol. Reichsanst.* no. 133/135, 12 pp., 16 figs. Berlin, August 1934.

Lists are given of the species of Scolytids attacking pines, chiefly in Germany, arranged according to the kind of mine, part of tree attacked,

age of trees involved, degree of harmfulness, variety of pine, and month in which flight occurs, together with descriptions, usually with illustrations, of the mines of 21 species.

ANDERSEN (K. T.). **Biologie des Kornkäfers** (*Calandra granaria* **L.).** [Biology of *C. granaria*.]—*Nachr. SchädlBekämpf.* (A) **9** no. 3 pp. 105–131, 11 figs., 15 refs. Leverkusen, August 1934.

All stages of *Calandra granaria*, L., are described, and notes on its biology are given from the literature. Personal observations in Germany showed that the egg-stage lasted 10–11 days at 26°C. [78·8°F.] and 3 months at 17°C. [62·6°F.]. Oviposition still occurred at 30°C. [86°F.] but ceased at 34·5°C. [94·1°F.]. The adults resisted starvation longest in a damp atmosphere. At 100 per cent. relative humidity they withstood starvation for 3 weeks at 28°C. [82·4°F.], 2 months at 18–20°C. [64·4–68°F.] and up to 1 year at 5–6°C. [41–42·8°F.]. Dryness shortened their life, but even in quite dry air (0–10 per cent. humidity) they lived for up to 18 days at 5–6°C. and 12 at 28°C. It would therefore be possible for them to survive in empty warehouses during the summer until the new crop is brought in. They survived submersion in water for 3 weeks at 6°C. and for 14 days at 18–19°C., but did not live so long in water from which the air had been expelled by boiling, or in an atmosphere of nitrogen free from oxygen. They showed negative phototaxis and marked thigmotaxis.

The larvae ceased moving at 6·4°C. [43·52°F.] and rigidity began at 5·1°C. [41·18°F.]. Crippling by warmth began at 36·6°C. [97·88°F.] and death occurred at 38°C. [100·4°F.]. Larval life was passed inside the grain of the cereal, which was rarely competely hollowed. In decreasing order of preference the cereal foods of the adults were rye, oats, barley, wheat, and barley and oats from which the husks had not been removed. For oviposition the order was barley, rye, wheat, barley with husks, oats, and oats with husks. Complete development was observed in broken seeds, even in small pieces ; experiments with flour have already been noticed [*R.A.E.*, A **20** 493].

Development was completed most rapidly (in 34½ days) at 28°C. and 70 per cent. humidity, but mortality was lowest at 21°C. [69·8°F.] and 85 per cent. humidity. The observations made indicated that a pair of adults could increase in one year to 1,000 individuals in an unheated warehouse and to over 300,000 in a heated one.

SCHEIDTER (F.). **Forstentomologische Beiträge. 14–38.** [Contributions to Forest Entomology, 14–38.]—*Z. PflKrankh.* **44** nos. 5, 7, 8, 10 pp. 223–226, 362–379, 386–423, 497–525, 3 figs. Stuttgart, 1934.

No. 14 (pp. 223–226, 362–365) of this series of papers on German forest insects [*cf. R.A.E.*, A **14** 382] describes the urticating hairs in the third and subsequent larval instars of *Thaumetopoea processionea*, L., *T. pinivora*, Treit., and *T. pityocampa*, Schiff. No. 17 (370–373) describes the fertilisation and oviposition of *T. processionea*. All the eggs, which totalled only from 57 to 132 per female, were laid on an oak twig in one batch. The average life of a female was 1½ days. No. 18 (373–374) records the number of eggs (85–255 and 95–251 respectively) laid on pine by *T. pinivora* and *T. pityocampa*, which also oviposit once only. No. 26 (402–404) describes the methods of feeding

on pine needles of the five larval instars of *T. pinivora*; they were similar to those of *Diprion* (*Lophyrus*).

No. 16 (369) gives a list of Ichneumonids bred from the pine sawfly, *D.* (*L.*) *pini*, L., including *Spilocryptus nubeculatus*, Grav., *S. tibialis*, Thoms., *Gelis* (*Pezomachus*) *cursitans*, F., *G.* (*P.*) *coelebs*, Ratz., *G.* (*P.*) *pedicularius*, F., *Microcryptus subguttatus*, Grav., *M. basizonus*, Grav., *M. sericans*, Grav., *Leptocryptus strigosus*, Thoms., *Hemiteles castaneus*, Tasch., *Pimpla alternans*, Grav., *Holocremnus cothurnatus*, Hlmgr., *H. clandestinus*, Hlmgr., *H. heterogaster*, Thoms., *H. ratzeburgi*, Tschek, *Mesochorus fulgurans*, Hal., *Lamachus marginatus*, Brischke, *L. lophyrorum*, Htg., *L. frutetorum*, Htg., *L. intermedius*, Ratz., *Zemiophorus scutulatus*, Htg., *Hypsantyx impressus*, Grav., *Exenterus marginatorius*, F., *E. oriolus*, Htg., *Microplectron fuscipenne*, Zett., *Meteorus albiditarsis*, Curt., *Eupelmus vesicularis*, Retz. (*degeeri*, Dalm.), *Monodontomerus dentipes*, Boh., and *M. obsoletus*, F. In no. 21 (377–379), are recorded observations of larvae of *D. pini* (as many as 80 per cent. in some batches) that became free from parasitism by Tachinids after moulting, the eggs or young maggots being found on the cast skins. Similar observations were subsequently made with the nun moth [*Lymantria monacha*, L.] and *Malacosoma neustria*, L. No. 22 (385–387) and no. 31(500–502) describe the oviposition of *Microcryptus* (*Phygadeuon*) *basizonus* f. *pteronorum*, Htg., and *Exenterus marginatorius*, respectively, in the larvae of *D. pini* inside their cocoons. No. 27 (404–406) records parasitism of the eggs of this sawfly by a Scelionid, *Teleas* sp., 1,238 out of 2,459 being attacked in one instance, while in others the maximum was 80 per cent.

No. 28 (406–411) is a key to the larvae of the German species of *Diprion* (*Lophyrus*). No. 19 (375–376), no. 34 (507–508) and no. 38 (524–525) describe, respectively, the various larval instars of *D.* (*L.*) *pallidus*, Klug, *D.* (*L.*) *socius*, Klug, and *D.* (*L.*) *sertifer*, Geoff. (*rufus*, Retz.), all of which feed on pine. No. 30 (497–500) describes the method of oviposition of the species of *Diprion* of which the larvae feed singly. They comprise *D.* (*L.*) *polytomus*, Htg. (*hercyniae*, Htg.) and *D.* (*L.*) *abieticola*, D. T., on spruce, and *D.* (*L.*) *nemoralis*, Enslin (*nemorum*, F.), *D.* (*L.*) *virens*, Klug, *D.* (*L.*) *laricis*, Jur., *D.* (*L.*) *frutetorum*, F., and *D.* (*L.*) *variegatus*, Htg. (*thomsoni*, Konow) on pine.

No. 15 (365–369) and no. 25 (400–402) deal respectively with egg-production in the willow-borer, *Cossus cossus*, L., and in the poplar clearwing, *Trochilium apiforme*, Clerck, the females laying 905–1,492 and 955–1,190 eggs. No. 29 (411–423) describes in detail reproduction in *Sphinx* (*Hyloicus*) *pinastri*, L., infesting pine and spruce. Pairing and oviposition occurred by night. From 379 to 668 eggs were found in the ovaries, and apparently almost all were deposited. Parthenogenetic eggs were sterile. The eggs and female genitalia are described. No. 37 (519–524) describes pairing, oviposition and the female genitalia of *Smerinthus populi*, L., and *S. ocellatus*, L.; dissected ovaries contained 514–547 and 855–961 eggs, respectively.

No. 20 (375–376) deals with the attraction of the males of *Notolophus* (*Orgyia*) *antiquus*, L., by the females; pairing occurred as soon as the latter emerged. No. 23 (387–399) records that females of *Lymantria monacha* laid 220–451 eggs, by night only. Unfertilised females, which sometimes oviposited by day, laid from 42 to 299 eggs, all sterile. The life of a fertilised female was 9–12 days, and of an unfertilised one about 15. The reproductive organs of the female are described. Oviposition began on the third day after emergence, so

that destruction of the females [*cf.* **19** 702] should begin as soon as the first is seen.

No. 24 (399–400) gives the following list of Ichneumonids found attacking the Tachinid, *Ernestia* (*Panzeria*) *rudis*, Fall., an important parasite of the pine Noctuid [*Panolis flammea*, Schiff.] : *Microcryptus arrogans*, Grav., *M. brachypterus*, Grav., *Phygadeuon vagans*, Grav., *P. variabilis*, Grav., *P. subtilis*, Grav. (*flavicans*, Thoms.), *P. vexator*, Thnb., *Hemiteles castaneus*, *H. pedestris*, F., *Homotropus pectoratorius*, Grav., and *Astiphromma scutellatum*, Grav. No. 33 (507) records the following hyperparasites bred from *Banchus femoralis*, Thoms., from cocoons of *Panolis flammea* : *Cryptus dianae* var. *gracilicornis*, Grav., *Microcryptus rufipes*, Grav., *M. basizonus*, *Hemiteles castaneus*, and *Meteorus albiditarsis*.

In no. 32 (502–506), oviposition by *Malacosoma neustria*, *M. castrensis*, L., and the birch Lasiocampid, *Eriogaster lanestris*, L., is described ; all three oviposit once only. Dissected ovaries contained respectively 75–329, 458–661 and 320–355 eggs per female. No. 35 (508–512) deals with oviposition by the oak Lasiocampid, *Lasiocampa quercus*, L. Females laid from 47 to 289 eggs ; those laid by unfertilised females were not viable. The female genitalia are described.

In no. 36 (513–518), an account is given of oviposition by *Sirex augur*, Klug, and *S.* (*Paururus*) *noctilio*, F., both infesting silver fir [*Abies*]. The average numbers of eggs in the ovaries were 1,000–1,100 and less than half that number respectively. The eggs of both species are described.

Lehmann (H.) & Becker (M.). **Luzerneschädlinge. 3. Die Bekämpfung des linierten Blattrandkäfers** (*Sitona lineata* **L.**) **auf Luzerneschläge mittels arsenhaltiger Staubmittel.** [Lucerne Pests. 3. The Control of *S. lineata* in Lucerne Fields by Means of Arsenical Dusts.]—*Z. PflKrankh.* **44** no. 10 pp. 486–497, 2 figs., 9 refs. Stuttgart, 1934.

In Thuringia, *Sitona lineata*, L., is a serious pest of lucerne, especially in early spring when the hibernated adults attack the young shoots and no other food-plant is available [*cf. R.A.E.*, A **22** 4]. Control is best effected by arsenical dusts distributed by means of bags made to a pattern illustrated and described. Dr. Lehmann uses six, hung on a pole carried by two men. The distance between the bags is double that of the drills, so that of 12 rows the even numbers are dusted as the men walk in one direction and the odd numbers as they return. Newly germinated lucerne is dusted by dragging the bags over the plants, but with one-year-old lucerne the inequalities would cause an uneven scattering of the insecticide, and the bags are best carried over the plants and shaken gently. In the first case from 7 to 11 lb. are required per acre, and in the second 11 or 12. Field experiments in April 1934 demonstrated the effectiveness of this measure against *S. lineata*.

Dr. Becker analysed the arsenic content of lucerne plants picked at intervals of 10–12 days after dusting. The results are tabulated and show that in one locality after 44 days 10 kg. of fresh plant material contained only 4·7, 2·1 and 5·1 mg. arsenic, while in another only 7·9 mg. were found after 33 days. Cattle would therefore have to consume several times their own weight of fresh lucerne in a day to ingest a minimum fatal dose.

Schwerdtfeger (F.). **Verlauf und Ausdehnung der Forleulengradation 1932/33 in Preussen.** [The Course and Extent of the Pine Moth Outbreak in 1932–33 in Prussia.]—*Mitt. Forstwirtsch. Forstwiss.* 1934 pp. 5–12, 1 map. Hanover, 1934. **Beobachtungen zur Phänologie der Forleule im Jahre 1933.** [Obervations on the Phenology of the Pine Moth in 1933.]—*T.c.* pp. 34–55, 14 figs., 9 refs. **Bestandesalter, Ertragsklasse, Kronenklasse und Forleulenfrass.** [Age of Crop, Productiveness Class, Tree Crown Class and Pine Moth Attack.]—*T.c.* pp. 132–138, 8 figs., 19 refs. **Neue Untersuchungen und Erfahrungen zur Prognose von Forleulenkalamitäten.** [New Investigations and Experiences relating to the Prediction of Pine Moth Outbreaks.]—*T.c.* pp. 141–153, 3 figs. **Die Bekämpfung der Forleulenkalamität 1933 in den preussichen Staatsforsten.** [Work against the Pine Moth Outbreak in 1933 in the Prussian State Forests.]—*T.c.* pp. 185–192, 2 figs.

In the first of these papers, a brief survey is given of the occurrence of *Panolis flammea*, Schiff., on pines in Germany and Poland since 1930, with records of the distribution and intensity of the infestation in Prussia in 1932–33. As very few pupae were found in August 1933, the outbreak could be considered as ended. The second paper records the seasonal occurrence of the various stages in 1933 in Prussia. The larvae pupated between 9th and 25th July, but their numbers had been very greatly reduced by disease and by the Tachinid, *Ernestia rudis*, Fall., which entered the pupal stage between 5th July and 1st August. The average period between adult emergence and pupation of *P. flammea* was 79–85 days, the larval stage lasting 55–59 days.

In the third paper, the effect of various conditions of the trees on infestation is discussed. Stands of age between 20 and 100 years were most commonly attacked, the average age being 65 years. At the edges of the infested areas the age of infested stands was less. Infestation was least severe in stands of the highest class of productiveness and rose with the gradual decrease in productive character to a maximum in the lowest. Within a given stand the loss of needles was smallest in dominant crowns and greatest in those that were lowest. The fourth paper supplements one on the prediction and control of outbreaks [*R.A.E.*, A **21** 38], and discusses methods of making counts of the pupae and eggs in estimating abundance.

In the fifth, an account is given of control work in the Prussian state forests in 1933. The areas dusted by aeroplane included about 2,200 acres that were effectively treated by the " zebra " method, in which only half the usual number of flights are made, spaced at twice the usual distance apart and therefore requiring only about 22 instead of 44 lb. of contact insecticide per acre. Where possible, side winds were utilised to ensure an adequate spread. This method is based on the observation that while moderate dusting kills only 70 per cent. of the pine moth larvae, the survivors are cleared off by Tachinids. It is necessary for success that the insecticide used should be one that does not harm the parasites and that the pine moth larvae should be young and consequently sensitive to moderate amounts of it. Moreover there should be a sufficient number of parasites, and the pines should have enough needles to enable them to withstand any injury that may develop on the undusted strips. In all about 24,000 acres were dusted ;

power dusters were found effective for treating areas as large as 5,000 acres and could work in wind conditions unsuitable for aeroplane dusting.

TRAPPMANN (—). **Forleulenbekämpfung 1933 in Deutschland.** [Pine Moth Control in Germany in 1933.]—*NachrBl. dtsch. PflSchDienst* **14** no. 10 pp. 98–99. Berlin, October 1934.

Summaries are given of the last paper noticed in the preceding abstract and of a report by G. Behrendt on dusting against *Panolis flammea*, Schiff., on pines in private and municipal forests in Prussia and Mecklenburg, in which some 22,000 acres were treated with power dusters and about the same area with aeroplanes, contact poisons being used with excellent results.

REINMUTH (E.). **Blasenfusschäden am Sudangras.** [Injury by Thrips to Sudan Grass.]—*NachrBl. dtsch. PflSchDienst* **14** no. 10 pp. 97–98, 3 figs. Berlin, October 1934.

Haplothrips aculeatus, F., is recorded as attacking *Sorghum* (*Andropogon*) *halepense* in an experimental plot in Mecklenburg, perforating the leaves before they unfolded and deforming the panicles so that the formation of grain was affected.

SPRENGEL (L.). **Gegenwärtiger Stand der Kenntnisse über Pyrethrum als Insektengift.** [The Present State of Knowledge on Pyrethrum as an Insecticide.]—*Anz. Schädlingsk.* **10** nos. 1, 2, 10, pp. 1–7, 14–21, 111–117, 3 pp. refs. Berlin, January, February, October 1934.

This survey of the more important papers published on pyrethrum opens with an historical note and information on the world production of this insecticide. The main subjects dealt with are the chemical properties of pyrethrum and methods for their analysis, toxicity, lethal doses, and factors influencing toxic quality and action and the stability of spray solutions. A list is given of pests recorded by various authors as being susceptible to pyrethrum insecticides.

[SEVKET] SCHEWKET (N.). **Die Feigeninsekten und die wesentlichsten Ursachen der Feigenfruchtfäule.** [Fig Insects and the most important Causes of Fig Fruit Rot.]—*Anz. Schädlingsk.* **10** no. 10 pp. 118–119, 4 figs. Berlin, October 1934.

Lonchaea aristella, Beck., all stages of which are briefly described, is the chief pest of figs in Asiatic Turkey. It occurs throughout western Anatolia, wherever wild and cultivated figs grow, and has 5 or 6 generations a year. Hibernation takes place in the ground in the pupal, or very rarely the larval, stage. The flies appear in May and oviposit in the profici figs. After 25 days, the full-grown larvae drop from the fruits and pupate just over an inch below the surface of the soil, the adults emerging in a few days. From August to October, however, the pupae are found in the ripe Smyrna figs. In July the eggs are laid in the young fruits of cultivated figs, causing them to fall in 15–20 days ; in July 1933 about 30 per cent. of the fruits of cultivated and profici figs were infested and 25 per cent. of the crop was lost. Infested figs should be collected and burnt or buried with quick-lime at a depth of about 3 feet.

KAVEN (G.). **Krankheiten und Schädlinge an Rhododendren.** [Diseases and Pests of Rhododendron.]—*Kranke Pflanze* **11** no. 10 pp. 123–126. Dresden, October 1934.

Insects that attack rhododendrons in Germany include the winter moth [*Cheimatobia brumata*, L.], the Tortricid, *Peronea* (*Acalla*) *schalleriana*, L., which is usually a pest of strawberries, the Geometrid, *Arichanna melanaria*, L., the weevils, *Otiorrhynchus sulcatus*, F., and *O. singularis*, L., and, particularly in greenhouses, *Heliothrips haemorrhoidalis*, Bch., *Trialeurodes* (*Aleurochiton*) *vaporariorum*, Westw., *Pseudococcus citri*, Risso, and *P. adonidum*, L. The adults of the species of *Otiorrhynchus* feed on the leaves, and the larvae on the roots. The former may be collected by night, or the plants may be dusted with an arsenical, and the larvae may be removed from the soil by sieving or killed by steam. The Tingid, *Stephanitis oberti*, Kol., is a particularly dangerous pest of rhododendron, attacking plants in the open and causing the leaves to wither and fall off. It oviposits on the lower surface of the leaf, along the mid-rib. The overwintered eggs hatch in May or June, and the adult stage is reached in July. Repeated spraying with nicotine-soap and destruction of leaves with eggs on them are advised.

MUGGERIDGE (J.). **Entomology Section.**—*Rep. Dep. Agric. N.Z. 1933–34* pp. 42–43. Wellington [N.Z.] 1934.

In continuation during 1933–34 of work on the biological control of *Pieris rapae*, L., in New Zealand [*cf. R.A.E.*, A **22** 40], a field survey showed that the larval parasite, *Apanteles glomeratus*, L., liberated during the previous year, was only present in small numbers, but that the pupal parasite, *Pteromalus puparum*, L., had spread considerably, 58 per cent. of 415 pupae collected at random being parasitised. Further consignments of both species were imported. Of 240,000 adults of *A. glomeratus* that emerged from 425,000 cocoons received from England, 230,000 were liberated, but at a subsequent examination only 3 per cent. of the larvae of *Pieris* were found to be parasitised. Following the distribution of 11,500 adults of *Pteromalus*, 90 per cent. of 5,300 pupae of *Pieris* collected in the field were parasitised. A successful control of the larvae of this butterfly on cabbage and cauliflower was obtained by dusting with calcium arsenate and lime (1 : 5).

Encarsia formosa, Gah., has been successfully imported from England [*cf.* **21** 409] and established for the control of *Trialeurodes vaporariorum*, Westw., on tomato. Small quantities of parasitised material were distributed in the late spring of 1933, and one grower reported that this Aphelinid had effected complete control of the whitefly in a tomato house.

The results obtained in preliminary laboratory experiments with 26 specially prepared oils, varying in viscosity, method of emulsification and percentage of unsaturated hydrocarbons, against the winter eggs of *Paratetranychus pilosus*, C. & F., and *Bryobia praetiosa*, Koch, showed that the toxicity of stable emulsions increases with viscosity, but with unstable emulsions a 100 per cent. kill was secured with a considerably lower viscosity.

In further studies of *Odontria zealandica*, White [**22** 41], naphthalene was ineffective when injected into infested turf, and plants placed in soil into which it had been dug at a rate of more than 3 oz. per sq. yd.

were liable to be damaged by it. Salt (sodium chloride) was also useless. Various chemical manures tested had no effect on the efficiency of a top dressing of lead arsenate during a period of 11 months. An emulsion of carbon bisulphide and Restar [*cf.* **20** 557] did not harm plants growing in cultivated ground during winter. It was equally effective when injected and when watered on to the soil.

In investigations in spraying apples against the bronze beetle [*Eucolaspis brunnea*, F.] [*cf.* **21** 67], spreaders and even fish oil caused too much lead arsenate to run off the fruit, and the most effective cover was obtained by a closely directed fine spray of lead arsenate alone (4 lb. to 100 gals.). Paris green, which was more toxic than the same quantity of lead arsenate, and barium fluosilicate, which gave control about equal to that of lead arsenate, both scorched the fruit severely.

GARDNER (L. R.). **Observations on the Trend of Scale Control Problems in Various Citrus Producing Areas of the World.**—*J. Ent. Zool.* **26** no. 3 pp. 29–33. Claremont, Calif., September 1934.

The following is taken from the author's summary : A review of the distribution of and injury caused by Coccids in various countries in which *Citrus* is grown raises many important questions as to climatic limitations, the value of quarantines, and the part that they have played in preventing the dissemination of pests. The Coccids that have spread most extensively are polyphagous species and those, such as *Aonidiella* (*Chrysomphalus*) *aurantii*, Mask., and *Lepidosaphes beckii*, Newm., that are capable of being transported for great distances on mature fruit. A great variation, however, sometimes occurs in the degree of damage caused by a given species in two countries with apparently identical climates. Cultural practice is of importance, for the dense planting of orange trees in Palestine has checked *A. aurantii*, which is favoured by sunshine. Control problems become more difficult each year in California, and a similar tendency is apparent in other countries. This seems to be due not only to the concentration of large plantations in one area, but also to a continuous effort to control a particular pest. The elimination of one major pest has sometimes left the trees open to attack by another that may have been controlled by it. For example, in South Africa, when *L. beckii* was controlled in some plantations, *A. aurantii* established itself and became a more serious pest. The latter species was found to have acquired resistance to fumigation in one orchard in South Africa, where this measure had been practised for many years, though on young trees a few miles away it was readily controlled.

DINGLER (M.). **Die Spargelfliege** (*Platyparea poeciloptera* **Schrank**). [The Asparagus Fly.]—*Arb. physiol. angew. Ent. Berl.* **1** nos. 2–3 pp. 131–162, 185–217, 40 figs., 1 pl., 25 refs. Berlin, May–October 1934.

The nomenclature, classification, distribution, morphology, and anatomy of the reproductive and digestive organs of *Platyparea poeciloptera*, Schr., are discussed, all stages are described, and an account is given of investigations on its bionomics in Germany, where it has one generation a year. The adults occurred from about mid-April to mid-June, and usually lived for 12–20 days. The proportion of males to females was about 1·1 to 1. On emerging, the females fed extensively on the juice exuding from punctures made with the

ovipositor in asparagus shoots. The flies were active in sunshine but were easily caught in the early morning. They do not travel far from the food-plant. Lasting rain or cold killed large numbers of them. The females paired soon after emergence and oviposited in the parenchyma of shoots up to 22 ins. long. They laid 60–80 eggs but some of these did not develop. Upwards of 20 larvae, however, could be found in a single asparagus shoot. Infested shoots became bent. The larvae bored downwards in the shoot but did not reach the root-collar. Hibernation occurred in the pupal stage, which was particularly resistant to drought or moisture. Asparagus stubble heaped up in the field and incompletely burnt contained living pupae in the half-charred stems. The normal pupal period of 10 months could only be shortened by about 3 months by raising the temperature.

The shoots of plants 3 and more years old are cut during the flight-period, so that if the attack on immature plants (especially on those 2 years old, which are most heavily infested) could be controlled, the damage done by this Trypetid would be negligible.

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In continuation of previous work on wireworms in Germany [*R.A.E.*, A **22** 248], it was found that larvae of *Corymbites sjaelandicus*, Müll. (*tessellatus*, auct.) died on losing about 50 per cent. of their body-water, whereas those of *Agriotes lineatus*, L., died only after nearly all their body-water had been lost. In 8 per cent. solutions of chlorides of sodium, potassium or ammonium, larvae of *C. sjaelandicus* died after a water loss of 17 per cent., and those of *A. lineatus* after a loss of 25 per cent. In 8 per cent. solutions of potassium bromide, potassium iodide, potassium sulphate and sodium carbonate, the larvae of *A. lineatus* again proved more resistant. It was thought that the difference in the resistance of the two species might be due to a difference in the salinity of their body-fluids, and it was found that the electric conductivity was much less in *C. sjaelandicus* than in *A. lineatus*, showing a much smaller salt-content in the former.

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An account is given of the measures taken against *Leptinotarsa decemlineata*, Say, in the district of Stade, Germany [*cf. R.A.E.*, A **22** 560].

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It has been found that *Nemeritis canescens*, Grav., is attracted to *Ephestia kühniella*, Zell., by a sense of smell [*R.A.E.*, A **22** 307], and

experiments in Germany here described showed that the scent concerned is associated with the webs of the larvae. The Ichneumonid oviposited on larvae of *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.) and even those of its own species when they were wrapped in the webs of *E. kühniella*. Webs that had been soaked for 24 hours in alcohol, ether, water or petrol did not attract the parasite.

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